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# USSR Report

CHEMISTRY

No. 94



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3 December 1982

## USSR REPORT

## CHEMISTRY

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ANALYTICAL CHEMISTRY

UDC 543.42

X-RAY FLUORESCENCE ANALYSIS OF ROCKS OF VENUS ON AUTOMATIC UN-MANNED  
INTERPLANETARY STATIONS VENUS-13 AND VENUS-14

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 37, No 8, Aug 82  
(manuscript received 27 Apr 82) pp 1349-1359

SURKOV, Yu. A., SHCHEGLOV, O. P., MOSKALEVA, L. P., KIRICHENKO, V. S.,  
DUDIN, A. D., GIMADOV, T. L., KUROCHKIN, S. S. and RASPUTNYY, V. N.,  
Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy,  
USSR Academy of Sciences, Moscow

[Abstract] Noting that the title space stations were continuing the work of "Venus-4" 15 years ago, the authors summarize the methodology used to examine rock specimens gathered and tested under harsh conditions including about 9 MPa of pressure and 500° C temperature. The rock-drilling and collecting device, the chamber for X-ray fluorescence measurements and the recording equipment are pictured, diagrammed and explained. Results indicated better success with this equipment with Mg, Al and Si when plutonium 238 was used than when the isotope was iron-55, but the plutonium did not permit measurement of portions of a percentage point of K, Ca or Ti. The multi-channel amplitudinal impulse analyzer, external devices and controls are described and diagrammed. The radiation fluorescence stimulated by the isotopes was recorded on a spectrometer with 256 channels, and the information transmitted to earth by telemetry. The equipment on both landing modules operated effectively under the given conditions, allowing measurements of the chemical composition of Venusian rocks. Figures 13; references 4: 3 Russian, 1 Western.  
[337-12131]

UDC 543.426:546.791

ASSAYING MICROQUANTITIES OF URANIUM BASED ON LUMINESCENCE GENERATED BY LASER RADIATION

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 37, No 8, Aug 82  
(manuscript received 24 Jul 81) pp 1466-1468

SOKOLOV, A. K., SOKOLOV, M. M. and TITOV, V. K.

[Abstract] The most sensitive method for assaying uranium has been based on the photoluminescence of  $KNaCo_2$ -NaF crystals, but this method requires long preparation of specimens. Proposed methods using lasers do not meet requirements for determining uranium in natural waters. The authors have developed the title method involving transition of uranium into silicate complexes with a limit of detection at  $(1.5 \cdot 2) \cdot 10^{-11}$  g/ml. The method uses periodic impulse laser radiation and stroboscopic signal accumulation of useful luminescence in a broad temporal strobe. Procedures are summarized in the experimental section. Use of  $Na_2O \cdot 3SiO_2$  made it possible to intensify the luminescence by a factor of 25 and increase the fade time to 500 mcs. In comparison with the 14% mean error for other methods, this method had an error of only 4%. The experiment detected as little as  $1.5 \cdot 10^{-11}$  g/ml of uranium. Figures 3; references 4 (Russian).

[337-12131]

UDC 539.196.2+546.185

STUDY OF REACTION CENTERS OF AMIDES OF PHOSPHORIC ACIDS BY METHOD OF MOLECULAR ELECTROSTATIC POTENTIAL

Kiev TEORETICHESKAYA I EKSPERIMENTAL'NAYA KHIMIYA in Russian Vol 18, No 4, Jul-Aug 82 (manuscript received 30 Jun 81) pp 477-481

KLIMENKO, V. Ye., PEINEL, G. and PEN'KOVSKIY, V. V., Institute of Theoretical Physics, UkrSSR Academy of Sciences, Kiev; Karl Marx University, Leipzig, GDR; Institute of Organic Chemistry, UkrSSR Academy of Sciences, Kiev

[Abstract] Amides of phosphoric acids are used in producing numerous biooligomers, pesticides and anti-tumor preparations as well as for other purposes. Quantum chemical methods offer a new approach to expanding knowledge of these compounds. The authors here present results of quantum mechanical study of amides of phosphoric and 0,0-dimethylphosphoric acid by the title method. They review the history of the method and its limitations in defining closely similar isopotential curves. To determine molecular electrostatic potential (ESP), quantum mechanical calculations to find elements of the density matrix must first be made. The authors used a tetrahedric hybridization model for their calculations of phosphorus atoms. The charts obtained showed the negative potential in the environment of oxygen atoms of

the phosphoryl groups, while a positive potential surrounded the amide groups. Data allowed generalizations on the nature of chemical conversion of various compounds that were studied. Similarity of isopotential curves of the amides  $(HO)_2P(O)NH_2$  and  $(CH_3O)_2P(O)NH_2$  justifies application of the conclusion--that the reactant approaches an unshared pair of oxygen atoms during electrophile substitution or complex formation--to other molecules of the  $(RO)_2P(O)NH_2$  type as well. Figure 1; references 17: 5 Russian, 12 Western.  
[343-12131]

UDC 543.422.25

#### EQUILIBRIA IN SYSTEM ARSENAZO III-URANYL IONS IN SOLUTIONS

Kiev TEORETICHESKAYA I EKSPERIMENTAL'NAYA KHIMIYA in Russian Vol 18, No 4, Jul-Aug 82 (manuscript received 12 Oct 81) pp 507-510

POGONIN, V. I., LIKHONINA, Ye. A., SAVVIN, S. B. and CHIBISOV, A. K., Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, USSR Academy of Sciences, Moscow

[Abstract] Temperature-shift study of complex formations based on rapid heating is a very promising approach to studying kinetics and reaction mechanisms. The authors studied relaxation process kinetics in the title system in acidic water solutions using this method. The solution was heated to 6 K in  $1 \cdot 10^{-5}$  seconds by a high voltage condenser through a teflon cell with platinum electrodes and conical quartz windows. The oscillogram showed rapid and slow relaxation variants in the system. Details of these processes are summarized. The temperature-shift method made it possible to establish the several types of complexes formed, observe phenomena of the relaxation processes and determine the values of rate constants for the slow stage of the reaction. Figures 3; references 10: 5 Russian, 5 English.  
[343-12131]

## BIOCHEMISTRY

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### MICROBIOLOGY USED TO IMPROVE FODDER PRODUCTION

Baku VYSHKA in Russian 6 Aug 82 p 2

[Article by M. Mamed'yarov, director of the Microbiology Sector of the Azerbaijan SSR Academy of Sciences and doctor of chemical sciences: "Microbiology Used in Fodder Production"]

[Text] The Plenum of the Azerbaijan Communist Party Central Committee, which took place in March of this year, set a task for the scientists of the republic: a sharp increase in the productivity of livestock farming, improved fodder production, and production of higher quality fodder. Among other institutions of the Academy of Sciences, our Microbiology Sector was subject to just criticism at the Plenum. Indeed, our sector has obligations to the livestock farmers and we must do everything in our power to solve the problem of uncovering additional sources of raw materials in the republic and significantly expanding the fodder base.

Recently the sector's collective has obtained some reassuring results in laboratory conditions. This is the topic of our discussion.

An enzyme mass has been obtained which will help increase the protein content of certain plant substrates such as cotton plant stalks, grapevine crests and scraps, and pomegranate rinds, by 3-4 times, bringing it to 12-14 percent.

The practical realization of these developments, however, has run into one specific difficulty. The byproducts of cotton and grape processing are scattered throughout almost the entire territory of the republic. Collecting and obtaining these byproducts in separate regions and then processing them raises the cost of the finished product considerably. Therefore the sector developed a solid substrate method of fermentation that can be done on any farm with a livestock complex.

Using the system that has been developed, almost 4 tons of cotton plant stalks, grapevine crests and scraps were accumulated in the Khanlar Rayon. The fermentation products are presently undergoing zootechnical testing at the Animal Husbandry Institute of the republic's Ministry of Agriculture.

Introduction of this method of solid phase fermentation of the byproducts of viticulture alone will make it possible to obtain a significant quantity of additional fodder additives. Calculations show that processing 1 million tons of grapes results in 200,000 tons of pressed skins and crests. Then by increasing their protein content to 12-14 percent, around 20,000-25,000 tons of fodder protein are obtained. This will meet practically the entire demand in the republic for fodder protein. It is also worth noting that in the fermentation process, along with protein other useful and physiologically active compounds essential for animals are formed (sugar, free amino acids, vitamins, enzymes, and so on). Furthermore, in the process of fermentation, some of the cellulose is subject to destructive breakdown and as a result becomes easily digestible. Thus 50-60 percent of the mass of byproducts is assimilated into the animal's body. If one includes in these estimates grapevine scraps of which hundreds of thousands of tons remain unused, the republic could completely cover the protein shortage.

For practical realization of these developments, however, it is necessary to solve two important problems. The first involves the development, or rather the design, of devices for fine dispersion breakdown of the cotton plant stalks and grapevine scraps. It appears that the Azerbaijan Institute of Mechanization and Electrification of Agriculture will take a creative approach to solving this problem and will create an assembly for fine grinding of the grapevine scraps. From the very beginning it seems that the designers should consider small-scale assemblies that would allow every farm to organize the grinding and implement solid phase fermentation of grapevine scraps right on the premises. The second problem involves organization of production of the fermentation mass. But if the problem of developing the technology for fine dispersion grinding of cotton plant stalks and grapevine scraps still will require a specific amount of time, then construction of a shop for producing the fermentation mass apparently can be started in 1982. Similar production is already in place in Uzbekistan; we can at any time take advantage of the courtesy of our Uzbek comrades and secure for ourselves the completed technical documentation for organizing construction of analogous production here in our republic.

Construction of a shop for producing the fermentation mass will make possible the realization of solid phase fermentation for other types of plant substrates, including straw. Furthermore, construction of such a shop will make it possible, most importantly, to organize fermentation of grapevine crests, since they can be used without first being ground down. With this system the republic will be able to obtain at least around 8,000-10,000 additional tons of fodder protein. Successful resolution of this problem can become a significant contribution toward realizing the Food Program developed by the Party and the government and vigorously supported by all the people.

9967  
CSO: 1841/14

CATALYSIS

UDC 547.358.11

CATALYTIC ACTIVITY OF ALKYLSTANNIC ACYLATES IN REACTION OF 2,4-TOLUYLENEDIISO-CYANATE WITH TRIETHYLENE GLYCOL

Leningrad ZHURNAL OSHCHEY KHMII in Russian Vol 52, No 8, Aug 82  
(manuscript received 31 Dec 81) pp 1866-1871

ALIYEV, I. M., NOSKOV, N. M., TASIROVA, M. E., KLYUCHINSKIY, S. A.,  
DERGUNOV, Yu. I., ZAVGORODNIY, V. S., ROGOZEV, B. I. and PETROV, A. A.,  
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[Abstract] The most active and selective catalysts for urethane formation are stanno-organic compounds such as dibutyldilaurinate, dibutyldicaprylate, dibutyldiacetate and other derivatives of tetravalent tin. Yet these compounds do not permit production of viable polymers, and some activate hydrolysis and thermal oxidation destruction of polyurethanes. The authors attempted a systematic study of the effects of structural fragments involving the size of alkyl groups at the tin atom, the nature of the substituent in the acyl radical and their number. The test was conducted using the title reaction in comparison to use of vinyl derivatives of tin for synthesis of alkylstannic acylates of carboxylic acids of intermediate strength, which require greater heating. The structures of the products were established by infrared, NMR and NGR spectroscopy and their composition by element analysis. Activity of alkylstannic acylates in the urethane formation reaction was tested on 2,4-toluylenediisocyanate-triethyleneglycol in ethylacetate at 30°C. The dibutyldilaurinate of tin (DBDLO) was used for comparison. Results indicated that increasing the electron-donor and the electron-acceptor properties of the substituents in the aromatic ring of dialkylstannic(beta-phenyl)acrylates led to a loss of catalytic activity. The nature of acyl groups had less effect. Figure ; references 16: 10 Russian, 6 Western.  
[334-12131]

## CHEMICAL INDUSTRY

### CONSTRUCTION OF YEFREMOV CHEMICAL PLANT COMPLETED

Moscow STROITEL'NAYA GAZETA in Russian 15 Aug 82 p 1

[Article by A. Shonin, correspondent of press center of Minmontazhspetsstroy, Yefremov City, Tula Oblast: "A Key for Great Chemistry"]

[Text] The first test batch of the product is obtained in the production of sulfuric acid at the Yefremov chemical plant

From childhood and school we remembered the following: flasks, test tubes, glass tubules, small clumps of amber-yellow sulfur, and heavy drops of a transparent liquid similar to oil, sulfuric acid, which, if it gets on a finger, God forbid, it burns. The words of a teacher were recalled concerning the fact that this oily liquid is chemistry's "bread and butter."

Perhaps the construction workers and assemblers remembered these school lessons and, perhaps, they didn't, but this they knew thoroughly: the final product of their labor, enormous production output of sulfuric acid, is necessary to the country. They worked persistently and selflessly both in the rain and cold and also in the autumn slush.

The main burden of the work fell on the part of the general contracting trust of Yefremovkhimstroy and the Yefremov administration of the trust Soyuzprommontazh. Construction workers dug foundation pits, laid concrete foundations for the equipment with a volume of several of tens of hundreds of cubic meters, and erected the administrative building and spans of auxiliary workshops. Following on their heels, literally, were the assemblers, who assembled, welded and placed on supports of the foundations the pumps, compressors, gate valves, and pipelines. And often they quarreled: it happened that the construction workers were not able to prepare any stockpile for them, and the work was delayed. An outlet was found: the equipment was assembled in large units to the side, and as soon as the foundation "neared completion," it was put in place by cranes. About 7500 tons of different units and metal structures were assembled, 85 kilometers of pipelines were laid, and 3245 different shut-off plates and valves were installed.

The brigade of Vasiliy Istratov assembled the drying-absorption section, the brigade of Anatoliy Varfolomeyev - the pump water circulator, and Khuram Atayarov and his people assembled the pipelines and communication equipment.

In short, each assembler had something about which to be proud. The welders Valeriy Fedotov, Vyacheslav Soltovskiy and Basiliy Bushenkov displayed their genuine labor heroism.

The first kilograms of sulfuric acid were produced several days ago. Do we need to say what a festive occasion this was for the construction workers, assemblers, and repairmen - all participants of the construction. The assemblers presented an enormous symbolic key, made of stainless steel, to the operating personnel, representatives of the chemical plant.

The key of great chemistry. Because with the starting of production of sulfuric acid, the construction of chemical projects at Hefremov is not completed. Row on row the booms of powerful cranes "furrow" the sky: a complex of liquid fertilizer plants, with a capacity of 286,000 tons per year, is being constructed. A glucose-molasses combine is being constructed in the city itself. Next the raising of a plant of defluorinated phosphates will be carried out.

9978  
CSO: 1841/329

## BRIEFS

NEW PETROCHEMICAL COMPLEX--A large new petrochemical complex has been created in Gorkiy Oblast. It includes the large plant "EP-300" in the Novogorkiy petrochemical works and the production of ethylene oxide and glycois in the city of chemists, Dzerzhinsk. These two industrial plants are connected by a pipeline. The installation "EP-300" is efficient and designed for producing several hundreds of thousands of tons of ethylene and propylene annually. These products are delivered to Dzerzhinsk in liquidified form. The latest technology for producing ethylene oxide is applied here, and this makes it possible to improve considerably the labor conditions and mechanize and automate the many production processes. Construction workers completed the assembly of the equipment half a year earlier than the set schedule. The operating personnel, who with a lead time of two months put the complex into operation in designed capacity, caught up with the "shock-work" relay race. [By A. Yershov] [Text] [Moscow IZVESTIYA in Russian 15 Aug 82 p 2] 9978

REBUILDING CHEMICAL PLANT--Turkmen, SSR. Without production being stopped, the Chardzhou chemical plant imeni V. I. Lenin is undergoing radical reconstruction. In the last five years high-capacity complexes have been put into operation for producing sulfuric acid and complex phosphorus fertilizers. In the present year production of mineral fertilizers began here in the form of granules only. Users are now being supplied high-quality fertilizers with a considerably high content of phosphorus and nitrogen. Photographs: a spherical tank and horizontal storage vessel of the ammonia section of the ammophos shop; leader of socialist competition, operator B. Muradov. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 31 Jul 82 p 18] 9978

CSO: 1841/329

## PROTECTION OF CROPS THROUGH CHEMICALS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 11 Sep 82 p 1

[Article by Ye. Leont'yeva: "Chemistry on Guard of Harvest"]

[Text] How do we prevent crop losses from rapid development of weeds and from insects and pests and diseases? The workers of agriculture have received help from chemical means of protection, pesticides, which make it possible not only to save the harvest, but also create conditions for a more complete use of fertilizers not by weeds but, precisely, by cultivated plants.

Not a dozen industrial enterprises are engaged in the production of means of protection. Furthermore, chemical industry produces special plant growth regulators, seed disinfectants and defoliants to facilitate cotton picking. In the past year, measures have been taken to combat pests and diseases of agricultural crops on 97 million hectares. The result is that the value of the preserved harvest exceeded eight billion rubles. In the present year protective works will be conducted on more than 100 million hectares. For this purpose about 500,000 tons of chemical preparations are being produced. By 1985 this figure should increase to 680,000 tons. Nevertheless, the need of agriculture for pesticides is far from being completely satisfied: a total of 48-50%. By the end of the Five-Year Plan, the kolkhozes and sovkhozes will receive 60% of their need, and only by the year 2000 is it planned to achieve the optimal ratio of the means of protection and mineral fertilizers.

The reason for the present imbalance is mainly the fact that operations on creating the production of pesticides were begun by us comparatively recently. The choice of chemical means is rather small: with a need for 160 named preparations, industry provides only 57. The disproportion in the protection of various forms of plants is also noticeable. The cotton plant, sugar beet and certain forms of grain crops are poorly provided with pesticides, but such important crops as the sunflower, rape and soybean suffer even more.

What delays the growth in producing chemical means of protection of plants, and what hinders the output of the needed preparations? Most of all, perhaps, this is due to an insufficient production of raw materials. Herbicides (weed killers), fungicides (medicines from diseases) and insecticides (insect killers) all belong to complex organic chemistry, and this requires a great amount of raw materials and is a long path to the final production. At many

of these enterprises the labor productivity is low, there are many manual operations, and the periods of developing and introducing the preparations are dragged out. Only such radical means as the creation of the production of intermediate products can help here. Precisely by means of these products it is possible to eliminate the growing "natural economies" of the enterprises and introduce modern accelerated technologies for producing pesticides.

But where are the intermediate products taken? The chemical and petrochemical industry produces them for the needs of the tire makers, pharmacists and physicians. That which remains for the production of means of protection is, as a matter of fact, "crumbs." The "Soyuzkhimzashchita" Association put this question before the USSR Minkhimprom [Ministry of the Chemical Industry] and USSR Minneftekhimprom [Ministry of the Petrochemical Industry]; however, the proper understanding was not received. The requirement was reinforced by an appropriate directive instruction, and, nevertheless, the situation was not noticeably improved.

It remains to wish for a better and scientific base of chemical protection. Science is now required to develop effective preparations and forms of them which would make it possible to use them in small doses. Let us say that in volume rather a great many insecticides are being used, and this often creates a menace for the environment. And their effectiveness is not great. Also, there is the dipping of the seeds, which increases their germination. At the present time, being used for the dipping are mainly powders, up to 90% of the total production, but where would the liquid preparations be more useful here? In the first place, the liquid medicine reaches each grain, and, secondly, it is required considerably less than the powder preparation.

Its path of perfection is in the herbicides, which have the most massive circulation. Traditionally, a herbicide was sought for each weed, but if we remember that weeds are represented by more than 800 species, then it becomes clear that this path is long and hardly efficient. Workers of agriculture demand that science create mixture preparations, which make it possible to fight immediately against a whole complex of weeds. But, meanwhile, not more than 10% of such preparations is being produced.

We need to say that all these problems are being solved very slowly, periods of construction of production of new chemical means are being dragged out for years on end and design documentation for the construction of workshops is being developed on a low technical level. I cite this example. Two institutes are in operation of "Soyuzkhimzashchita": VNIKhSZR [All-Union Scientific Research Inst'lute of Chemicals Used for Plant Protection] in Moscow and VSETIG [expansion unknown] in Ufa. There are 16 doctors of science in the first institute and a total of one in the second one. The difference is appreciable, isn't this true? However, the preponderance in scientific forces gives, strange as it may seem, the opposite result: the Moscow scientists during the last Five-Year Plan developed a total of four preparations and the scientists at Ufa, 20, and almost all of them are already being produced. With the Muscovites, on the other hand, there is a low level of introduction, the relationship with production is poorly adjusted, and no attention is paid to the development of experimental facilities.

Of course, we must seek the causes of the deficiency of means of chemization of agriculture not only in the weakness of the raw-material base and imperfection of scientific developments. Industry has large reserves. Chemists must often "stretch out" the plan due to an increased load on the stably operating plants. The burden fell with difficulty in such cases on the leaders: the Vunarsk and Pervomaysk chemical plants and the Ufa Association "Khimprom." For seven months these three enterprises provided more than 2000 tons of chemical preparations above the plan.

But there are chronically lagging enterprises from which, judging by appearances, the demand is low. These can include the Chapayev plant of chemical fertilizers, which regularly fails to fulfill its plan. Due to the low level of leadership, this plant rapidly lost its "gold reserves" of specialists and at present is poorly adapted to solving complex technical problems. Leaders of the Sumgait Association "Khimprom" became accustomed to demand a preferential plan for themselves, in which it became the rule to underprovide the most important forms of means of chemical protection. Here, industrial discipline is extremely low, the equipment is operated by the unskilled, and it works till it breaks down, then stands idle and undergoes repairs not provided for by the plan.

On the whole, of all the ministries producing preparations of chemical protection, the Minudobreniy [Ministry of Fertilizers] has the best indices, and the worst of all are at the USSR Minkhimprom and Minchermet [Ministry of Ferrous Metallurgy].

If we compare the productive capacities of pesticides and their deliveries, then it is possible to see that they clearly do not jibe. Hidden beyond this difference in several tens of tons is also a large reserve of timely provision of the village with chemical production. This difference appears because dispatching has become one of the weakest links in the "plant-to-field" chain. The fact is that production of pesticides increases, but it is not provided with packaging. Chemists must make the packaging at their plants, and once this is done in a noncentralized location, the inevitable difficulties appear: first there is no polyethylene, then no metal, and then a shortage of machinery.

The problem of mechanizing the protection operations has not been solved. Now only the main processes are mechanized: spraying, dusting and disinfecting (of seeds). At the same time, the preparation of chemical solutions and emulsions is most often carried out manually. Now, with the transition of the growing of agricultural crops through industrial technologies, the village is in need of high-speed wide-intake units with unified tools for introducing pesticides. There is a need for more disinfecting machines and mechanisms for preparing solutions for spraying. Providing the villages with this equipment is an urgent task of agricultural machine building.

A high level of organization and sophistication of the work is important from the viewpoint of the protection of the environment. The protection of the plants must be safe for the soil, water, animals, and, of course, for man. The editorial office receives letters whose authors, prompted by cases of

irresponsible handling of chemical weed and pest killers, propose banning them and going completely over to biological methods of combatting pests of the fields. It must be said that with respect to areas of processing, we do not yield to the highly developed countries in biological preparations. They are now being used on 17 million hectares, which makes up about 16% of the total volume of plant protection. In comparison with 1970, the production output of biological preparations has doubled, and it will be further increased. The nation has about a thousand biological laboratories and factories; their equipment is being improved from year to year, and a gradual transition of the automated lines to round-the-clock operation is being carried out.

Nevertheless, there isn't any basis for rejecting chemical protection. The biological methods are still not competitive enough from the viewpoint of economics (they are quite expensive) and in the level of effectiveness (they can not combat a whole complex of pests, since they are designed for only one species).

As regards the chemical preparations, the skillful and competent handling of them makes it possible to reduce the pollution of the environment to a minimum. Here it is especially important that each case of the breaking of the regulation, dosings, formula, nonobservance of periods of use, and all facts of the incorrect storage in the most careful manner be considered by the inspecting organizations.

In connection with the tasks set forth by the Food Program, the main attention of the "Sel'khozkhimiya" Association must be directed at introducing progressive methods of plant protection.

Due to weeds, pests and diseases, agriculture loses up to a third of the harvest in some years. Hence it is clear how important are the role of the service for protecting the plants and the reliable work of the "factory to field" supply line.

9978  
CSO: 1841/329

## COMPLEXONS AND METALLOCOMPLEX CATALYSIS

Moscow EKONOMICHESKAYA GAZETA in Russian No 24, Jun 82 p 17

[Article by Yu. Buslayev, Deputy Director of the Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, corresponding member of the USSR Academy of Sciences: "Chemistry of Astonishing Transformations"]

[Text] The creation of chemical and industrial processes for producing new substances and materials with pre-set properties is being provided in the 11th Five-Year Plan.

A progressive scientific trend emerged on the boundary of two independent fields, coordination chemistry and the science concerning catalysis (i.e., about acceleration of chemical processes). The object of the first field is to investigate complexons, or complex compounds, formed by an atom of metal and other molecules and ions so that it is possible to examine them as independent structural units from which the substance is constructed.

The essence of metallocatalysis lies in finding the kind of metals and compounds which would selectively increase the activity of molecules of substances. In other words, the accelerator-catalyzer of a great number of possible transformation "selects" that which yields the maximum effect. As a result, raw materials are saved and energy consumption is lowered for separating the products of a chemical reaction.

It is most difficult to convert the rigid molecules, for example, of nitrogen and oxygen, into an excited state. Catalysts to convert them have been found quite recently. Important achievements have been reached with findings at two institutes: Institute of Hetero-Organic Compounds and Institute of Chemical Physics of the USSR Academy of Sciences. A low-temperature process for binding the nitrogen of air and the subsequent conversion of it into stable compounds has been found. Developed methods of the synthesis of new complexes led to the involvement of the most inert compounds in chemical reactions.

Ideas of coordination chemistry, embodied into industrial catalysts, are now being successfully used by more than 40 large-tonnage chemical producers. Being produced at them is a wide assortment of materials used in industry and everyday life, from polyethylene and polypropylene to intermediate products necessary in the synthesis of lavsan [Dacron equivalent] and other synthetic fibers.

Recovery of petroleum is shifting to the east toward the little settled and remote regions. Development involves deep-lying oil-bearing layers. In this connection there appears the problem of improvement through the metallocomplex catalysis of processes of refining the crude oil and the saving of energy resources and auxiliary materials.

Scientists working with the complexons began by studying the chemistry of compounds of platinum metals.

Even until recently it was difficult to produce several tons of rare metals in a pure state (when a raw-material base is present). The fact is that to do this, precision methods for separating and purifying are required. This refers especially to twin elements, which are remarkably similar in their characteristics but have unique optical or electrical properties, in particular, superconductivity.

In electrical engineering, electronics and the nuclear industry, similar properties of rare elements and alloys were taken into the operation. Related pairs (similar in grouping in the Mendeleev Periodic Table) of such metals as niobium and tantalum and zirconium and hafnium are now being introduced into industrial production. Technological processes, based on use of complex compounds, always involved in the methods for extraction of the metals from ores, their separation and production in especially pure form.

Here is what is dispersed...

Of the rare elements, the so-called family of rare-earth elements was enlisted later than all the others into the service of the national economy. They are scarce due to their dispersion. The metals are also so similar in their properties that in nature they are always found in a group of three to five elements. The separating process, therefore, is very complex and laborious.

In many countries they seek methods of simplifying the production and, consequently, lowering the cost of it. In turn, this is associated with the appearance of fine differences in the chemical behavior of complex compounds. In hydrometallurgy of nonferrous, rare and precious metals, the role of the new processes is growing each year. These are based on precise description of the state of the complexons in different media. Stability of the compounds in water and organic media and the effect of salt composition are considered. Methods of recovering chemical compounds for subsequent production of non-ferrous metals take on special importance. Here the capacity of metals for complexing lies at the basis of the processes.

Now a new important section of science has been formed: the chemistry of complex compounds with a metallic bond. In other words, these are compounds where several heavy atoms of the metal are connected with each other. This is a completely unique metal-to-metal bond. There are comparatively few of them. The most studied of these metals are copper, tungsten, and also rhenium and rhodium.

When under laboratory conditions a rhenium compound was obtained, in which the rhenium-rhenium bond was found to be shorter than that in the metallic bond, it was decided not to publish the obtained data for several years because of unconventionality. Now, synthesis of substances with strong multiple bonds of heavy atoms have become an everyday phenomenon. Obtained quite recently at the Institute of Physical Chemistry of the USSR Academy of Sciences is a compound with a frequency rate of metal-to-metal bond (form of chemical bond accomplished by two or three pairs of electrons, common for atoms) greater than four.

Thus we can expect the appearance of new materials with superconducting and catalytic properties. The use of the high volatility of a number of metallo-organic complexes, which form a molecular crystalline lattice, is very promising.

Problems of power engineering have forced scientists to develop new effective means of using restorable sources of energy: solar, wind, high tides, and geothermal waters. As yet only an insignificant part of the solar energy is directly converted into electrical power. The reason is associated with the present economic unjustified expenditures (high cost of semiconductors and difficulties in manufacturing batteries for large areas). More promising appears to be the photolysis (decomposition of molecules under the effect of absorbed light) of water by complex compounds of ruthenium and other metals for producing oxygen and hydrogen. And hydrogen, as we know, is a universal fuel and chemical raw material.

#### Prospects of phosphocomplexons

In the last decade phosphorus compounds have occupied a significant place in chemical science and industry. Previously they were known as mineral fertilizers. But now the chemistry of phosphorus has achieved great success.

Phosphates form the class of so-called inorganic polymers and serve as the base of many materials with unique optical properties. The complexons, created with their participations, appear in the role of exceptionally highly active reagents, and they are used in the chemical and oil refining industry, construction technology, and medicine. Extensive studies in the field of phosphocomplexons are being conducted at the All-Union Scientific Research Institute of Chemical Reactions and Especially Pure Chemical Substances.

Under conditions of the intense scientific and technical progress, the requirements for speed and reliability of analyses are increased. The Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy makes an important contribution to the development of methods and inspection. This applies, in particular, to the use of complex compounds. Specific reactions and new organic reagents were put into practice of plant laboratories.

Electronic and electrical engineering parts and responsible control systems should possess one important property - high reliability. As they say, all electrical instruments do not operate for two reasons: either there is no contact, or a closing occurred. In order for an "on-off" system to operate faultlessly, silver and gold are used in the manufacture of the contacts.

There are methods for secondary production of precious metals. But how do we extract the silver (and not affect the other components) in order to put it into service again? Highly selective oxidizers have been proposed for this purpose, and fundamentally new solutions to extracting the precious metals without disrupting the base have been found. The industrial assimilation of them provides considerable savings.

Special properties of acids were discovered when one strong acid forms complexes with another. They are called superacids or magic acids. The reactivity of such compounds is so great that with molecules at room temperature there occur transformations which would only be expected in extreme conditions of pressure and temperature.

World recognition was given to works of scientists of the Institute of Bio-organic Chemistry imeni Shemyakin in the field of membrane processes, including transfer of compounds through biological membranes. They accomplish the selective storage of ions of specific metals and regulate the transport of substances in a cell, which is associated with low-energy complex-forming interactions. These problems occupy a central place in knowledge of principles of all physiological processes of living organisms.

Many institutes are engaged in the study of properties of complexes in the interests of agriculture. One trend is the application of compounds of iron, zinc and manganese as medicinal preparations in fighting diseases of fruit trees, chlorosis and small-leaf syndrome.

Successes in creating complex compounds is an answer to increased requirements presented by industry to industrial processes and materials. The constant coordination of work in research laboratories is one of the indispensable conditions for progress in this field. It is important to concentrate the efforts of scientists in creating the complex-chemical bases for underground leaching out of rare elements and extraction of them from sea water. The development of work in this direction will help to solve the many geochemical problems of the migration and deposition of mineral resources.

9978  
CCO: 1841/329

## COAL GASIFICATION

UDC 662.743

### STATUS AND PROSPECTS FOR FUEL PRODUCTION FROM COAL AND SHALE BY PYROLYSIS AND HYDROPYROLYSIS

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 4, Jul-Aug 82  
(manuscript received 6 Aug '80) pp 44-57

GEGUCHADZE, R. A., ROGAYLIN, M. I. and GREBENSHCHIKOVA, G. V., Institute of Mineral Fuels

[Abstract] The authors review the history of the title processes, particularly in the United States, emphasizing liquefaction and thermal conversion employing hydrogen, various methods of pyrolysis and indirect Fischer-Tropsche liquefaction. Various private and federal US coal gasification projects are discussed. In the USSR, thermal contact coking to process heavy petroleum residues, high temperature pyrolysis of solid fuels being developed at the Energy Institute imeni M. G. Krzhizhanovskiy, and hydrocarbonization, a dry method for coal hydrogenation, are being pursued. The Institute of Mineral Fuels is studying pyrolysis using "kerogen-70" shale from Estonia and brown coal from the Irsha-Borodino deposits. The methods being used are summarized. Controlled tests have determined the optimal conditions for autoclave coal and shale hydrophyrolysis to be 450° C temperature and hydrogen pressure of 7 MPA. This resulted in 18.5% liquid and 26.2% gaseous products from the brown coal, and 42.1% liquid and 27/4% gaseous products from sulfur coals. The kerogen-70 yielded 47.0% liquid and 41.9% gaseous fuels. Figures 3; references 49: 16 Russian, 33 Western.

[32/-12131]

COMBUSTION

UDC 541.11.127

INSTABILITY OF SURFACE PROPERTIES DURING BURNING OF SILANE

Moscow KHIMICHESKAYA FIZIKA in Russian No 8, Aug 82 (manuscript received 10 Mar 82) pp 1105-1109

AZATYAN, V. V., ARUTYUNYAN, G. A., KALKANOV, V. A., MARTOYAN, G. A. and SHAVARD, A. A., Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] The authors discovered and studied significant changes in surface properties as affected by solid products and active intermediate combustion substances in burning silane with  $O_2$ , and considered principles of the chain process as affected by reverse instability of the surface during the burning. Although the ignition point was regarded to be an important index of the effectiveness of heterogeneous chain fracture, the formation of a solid product interfered with this measurement. Solid products of silane combustion significantly increased the effectiveness of heterogeneous destruction of active centers. Oxidation products of  $SiH_4$  and hydrogen atoms passified the contact surface with the precipitated solid products of silane combustion. Figures 4; references 12: 11 Russian, 1 Western (by Azatyan, et al.)

UDC 541.127

INVERSE PROBLEM OF BURNING THEORY ON EXAMPLE OF ISOTHERMAL FLAME OF DECOMPOSITION OF NITROGEN TRICHLORIDE

Moscow KHIMICHESKAYA FIZIKA in Russian No 8, Aug 82 (manuscript received 16 Mar 82) pp 1110-1121

KAGANOVA, Z. I. and NOVOZHILOV, B. V., Institute of Physical Chemistry, USSR Academy of Sciences, Moscow

[Abstract] Since the combustion or burning theory was developed the question of resolving the inverse problem, finding characteristics of chemical conversions from flame properties, has been posed. Such factors as the dependence of chemical reaction rate on temperature, multicomponent nature of the system, and lack of sufficient information on transfer coefficients led the authors

to the present theoretical presentation. They attempted to analyze experimental data on the title decomposition and compare them with computer run data to obtain information on the mechanism of the reaction. Their presentation is divided into sections on defining the task, results of computer integration of differential equations, analysis and interpretation of experimental data, and comparison of theoretical findings with those in the experiment. Their comparison indicated that the reaction takes place with varying degrees of quadratic chain branching in mixtures with various inert diluents. Figures 4; references 15: 13 Russian, 2 Western.  
[339-12131]

UDC 662.61

ACTIVITY OF PRECHAMBER TORCH AS A FUNCTION OF TIME OF COMBUSTION PRODUCTS' PRESENCE IN PRECHAMBER

Moscow KHMICHESKAYA FIZIKA in Russian No 8, Aug 82 (manuscript received 30 Sep 81) pp 1122-1129

SEMENOV, Ye. S., Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] Heat, hydrodynamic and chemical factors contribute to the efficient combustion of a prechamber torch. This report is a study of the less well-known aspect, chemical factors, or the ability of all chemically active components to initiate, stabilize and promote burning of the combustible mixture. This capability is related to the concentration of unstable H, O and OH particles in the prechamber. To demonstrate this theory, the activity of prechamber torches with equal temperature, heat output and other parameters, using various fuels are compared experimentally. Chromatographic analysis of combustion products showed incomplete combustion in short prechambers. Chemical activity was directly related to the time the fuel was in the prechamber and the concentration and composition of chemically-active particles. Figures 2; references 15: 8 Russian, 7 Western.  
[339-12131]

EXPLOSIVES AND EXPLOSIONS

UDC 541.141.1

CRITICAL CONCENTRATION OF RADICALS IN LOW TEMPERATURE EXPLOSIVE CHLORINATION  
OF MECHANICALLY-CHARGED MATRICES OF SATURATED HYDROCARBONS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 266, No 1, Sep 82  
(manuscript received 24 Mar 82) pp 144-148

BENDERSKIY, V. A., MISOCHKO, Ye. Ya., OVCHINNIKOV, A. A., corresponding member, USSR Academy of Sciences, and FILIPPOV, P. G., Department of the Institute of Chemical Physics, USSR Academy of Sciences, Chernogolovka, Moscow Oblast

[Abstract] In the title process a maximum combustion temperature has been established related to the rise in thermostat temperature at which combustion takes place and the increase in radical concentration of a matrix when preliminary photolysis formed the radicals. In the current study the authors studied the dependence of the degree of conversion on radical concentration. They discovered the critical point and showed that in the range of  $K - K_{kp}$  an autofluctuating regime ensues as expected. Class-like mixtures of methylcyclopentane and chlorine in a 2 : 1 ratio were studied. In both test variants the impulse heating was close to adiabatic, and heat relaxation time was 1.0 - 1.5 seconds. Results showed that in "high temperature" explosion the impulse heating shifted the system into a liquid phase. The explosion was related to the fact that heating occurred faster than recombination of radicals and their concentration was higher by several orders than during photolysis at 140-200 K. The auto-fluctuations are a direct experimental proof of the creation of accelerating mechanical tensions during the course of the reaction. Figures 3; references 4 Russian, 2 Western.  
[1-12131]

## FERTILIZERS

### FERTILIZER FACTORY REACHES HIGH PRODUCTION MARK

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 14 Sep 82 p 1

[Article by I. Shlyakhtin in the column "Rhythm of Leading Work Weeks": "Fertilizer for the Fields"]

[Text] Nevinnomysk, Stavropol'skiy Kray--The Nevinnomysk "Azot" production association, recipient of the Red Banner of Labor, has produced 50 million tons of fertilizer since it first started production. The jubilee production mark was reached by the leading shift of S. Zakharchenko, leader in the competition for fitting observation of the 60th Anniversary of the formation of the USSR.

The first ton of ammonium nitrate was produced here in 1962. The association now supplies agriculture with carbamide, liquid ammonia, ammonium phosphate, nitrous ammonium phosphate and other products.

9967

CSO: 1841/14

LARGE FERTILIZER COMPLEX BEGINS OPERATION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 9 Sep 82 p 1

[Article from TASS, Kemerovo: "Putting into Operation: A Complex for Producing Carbamide"]

[Text] The largest complex on producing carbamide in Siberia will be put into operation tomorrow at the "Azot" Kemerovo Association. The capacity of this production will be 450,000 tons of granules of valuable nitrogen fertilizer per year

In accepting the completely automated complex from the construction workers, the chemists were obliged to bring the complex into planned capacity ahead of schedule and, due to this, dispatch tens of thousands of tons of fertilizers in excess of the plan.

9978  
CSO: 1841/329

UDC 631.859:633.16:631.589

ACTION OF LIQUID AND SOLID POLYPHOSPHATES OF AMMONIUM ON YIELD AND QUALITY OF HYDROPONIC BARLEY

Moscow ACROKHIMIYA in Russian No 8, Aug 82 (manuscript received 31 Aug 81)  
pp 42-48

SURGUCHEVA, M. P., BIBERGAL', Ye. A. and ZYABLOVA, I. N., All-Union Red Banner of Labor Scientific Research Institute for Fertilizers and Agricultural Soil Science imeni D. N. Pryanishnikov

[Abstract] Liquid--ZhKU (10:34:0)--and solid polyphosphates of ammonium, based on superphosphoric acid, differ from liquid and solid fertilizers, based on orthophosphoric acid, structure of the phosphate component and in their capacity to hydrolyze in contact with root systems and soil microflora. Contradictory results have been recorded in controlled studies of hydroponic growing. The authors studied continuous feed of condensed phosphates in an Arnon-Hogland medium, comparing 10:34:0, solid polyphosphate (N: 13.1%, P<sub>2</sub>O<sub>5</sub>: 56.5% (poly- 21.2% and ortho- 35.4%)) and monosubstituted ammonium orthophosphate for growth and yield of Moskovskiy variety barley. Mineral contents were determined in 43-day-old barley plants and in the harvested biomass after burning. With constant feed in a hydroponic system, liquid and solid polyphosphates of ammonium as an unhydrolyzed polyform are very effective in enhancing general biomass accumulations and grain yield, surpassing results with orthophosphates. Both grain and in some cases biomass showed increased mineral content. Related tests showed that application of microelements immediately after planting was more effective than application a month after planting. References 13: 12 Russian, 1 Western.

[344-12131]

UDC 631.811:631.445.51:631.587

MIGRATION AND LOSSES OF NUTRIENTS IN IRRIGATION OF CHESTNUT-MEADOW SOIL

Moscow AGROKHIMIYA in Russian No 8, Aug 82 (manuscript received 20 Oct 81)  
pp 64-67

KRIVONOSOVA, G. M., KORNIYENKO, N. P. and BASEVICH, T. V., Ukrainian  
Scientific Research Institute for Soil Science and Agrochemistry, Khar'kov

[Abstract] The authors studied losses of nitrogen, phosphorus and potassium and their migration when applied in increased amounts to irrigated plantations in Golopristanskiy Rayon of Kherson Oblast where chestnut meadow, secondarily moderately saline light loamy alkaline soils are found. Lysimeter tests were made at 50, 80 and 100 cm. Analysis of the soil samples before and after administration of standard fertilizer showed that the nitrate ion had the greatest ability to migrate, and its quantities in lysimeter waters were particularly great in the first 3 years studied, amounting to 160-280 kg/hectare of nitrogen. The lysimeter waters also had significant amounts of nitrogen when it was administered in ammonia, but these amounts were less than with nitrate fertilization. Below the depth of 1 meter, approximate nutrients levels were up to 40 kg/h of nitrogen, to 2.5 kg/h of phosphorus and up to 18 kg/h of potassium. References 4 Russian.

[344-12131]

UDC 631.82:633.11"321"(571.1/.5)

ROLE OF MINERAL FERTILIZERS IN PRODUCING SPRING WHEAT GRAIN IN SIBERIA

Moscow AGROKHIMIYA in Russian No 8, Aug 82 (manuscript received 2 Jun 81)  
pp 68-73

ANIKST, D. M., All-Union Red Banner of Labor Scientific Research Institute for Fertilizers and Agricultural Soil Science imeni D. N. Pryanishnikov

[Abstract] Current test data allow certain conclusions on the effectiveness of fertilization programs used in such areas as Chelyabinsk and Kurgansk oblasts, and Western and Eastern Siberia. The author, whose work was directed by V. G. Mineyev, used the natural agricultural taxonomy developed for the USSR land resource survey. He reviewed 340 short-term field tests that covered dry steppe, forest steppe and southern taiga forested regions of Siberia. Data were included for the oblasts of Tomsk, Kemerevo, Tyumen, Krasnoyarsk, Irkutsk and Chita, as well as the Buryat ASSR. Applications were generally N40-60 and P20-40. The author concludes that there is great need for careful local assessment of fertilizer needs in order to attain maximum effect. References 38 Russian.

[344-12131]

UDC 631.811:633.11

EFFECT OF DEFICIT AMOUNTS OF NITROGEN, PHOSPHORUS AND POTASSIUM ON RESPIRATION AND PRODUCTIVITY OF SPRING WHEAT. REPORT 2. LYSIMETER TESTS

Moscow AGROKHIMIYA in Russian No 8, Aug 82 (manuscript received 6 Oct 81)  
pp 74-81

KUPERMAN, I. A. and KHITROVO, Ye. V., Institute for Soil Science and Agro-chemistry, Siberian Division, USSR Academy of Sciences, Novosibirsk

[Abstract] The first report (this journal, No. 7, 1982) showed that where competition for light was removed, changes in wheat productivity were related to the formation of varying numbers of head shoots in tillering. The present report concentrates on parameters in the sixth leaf of the main stem, such as respiration, mass of dry matter, protein nitrogen, phosphorus and potassium, resulting from varying fertilizer applications over short time periods. Deficit amounts of each nutrient were supplied to specific test plants. The deficits were reflected at all measurement intervals. With a potassium deficit or a phosphorus deficit, nitrogen amounts increased. Phosphorus deficits also showed growth and hampered respiration, the latter in what was termed the "phase effect." Nitrogen-deficit leaves did not differ from the control in respiration. In general the greatest effects were noted in upper growth and the least in rapidly-aging lower plant organs. Methodological refinements should improve the accuracy of such tests. Figures 4; references 17: 7 Russian, 10 Western.  
[344-12131]

UDC 631.82:631.86:633.15:633.34

YIELD AND FODDER QUALITIES OF A CORN-SOYA MIXTURE DEPENDING ON APPLICATION OF ORGANIC AND MINERAL FERTILIZERS

Moscow AGROKHIMIYA in Russian No 8, Aug 82 (manuscript received 16 Oct 81)  
pp 87-90

YELESHEV, R. Ye. and BEKBOLATOV, S. Zh., Kazakh Agricultural Institute, Alma-Ata

[Abstract] One approach to increased production of plant protein is to expand mixed corn-soy bean plantings for silage. Field tests were made in 1978-1980 to determine optimum fertilizer amounts on chestnut meadow soils of the "Dzhanasharskoye" test farm in Kazakhstan. Increasing doses of P60K60 and P120K60 of 60, 120 and 150 kg/ha were administered along with organic fertilizers. Results showed that increasing amounts of nitrogen beyond a certain level benefited corn but had a negative impact on soy bean green mass. Optimum results were obtained using 20 tons/hectare of manure with N60P60K60, as well as with N60 on a P60K60 base and N120 on a P120K60 base. Protein increased by 1.2-4.3%, phosphorus by 0.04-0.11%, potassium by 0.41-0.85%, fat by 0.1-1.0%, ash by 1.0-2.1% and potassium by 0.01-0.16%. References 11 Russian.

[344-12131]

EFFECT OF CLIMATIC FEATURES OF GROWING SEASON ON ACCUMULATION OF MICRO-  
QUANTITIES OF  $^{137}\text{Cs}$  IN PLANTS

Moscow AGROKHIMIYA in Russian No 8, Aug 82 (manuscript received 20 Oct 81)  
pp 118-123

SHAGALOVA, E. D., Belorussian Scientific Research Institute for Soil Science  
and Agrochemistry, Minsk

[Abstract] Studies have shown that external factors have a major effect on the bond of the Cs radionuclide with the soil. The author studied  $^{137}\text{Cs}$  in crops from tests done in 1978 and 1979 on loamy and sandy soils of Central and Western Belorussia. In all soils, more radioactive cesium was found in the crops of cold and wet 1978 than in those of dry, hot 1979. Thus climatic factors clearly have a major role in fixing  $^{137}\text{Cs}$ . Both atmospheric and irrigational effects and the manner of cultivation affected this parameter. One influencing factor was that in the cold, wet year the root systems developed largely in the tilled layer, while in the hot-dry year, the roots sought water in deeper layers. Drying of soil led to the transfer of part of the readily accessible surface-absorbed form of cesium to inner surfaces and fixed forms, representing a significantly more durable bond. References 9 Russian.

[344-12131]

## NITROGEN COMPOUNDS

UDC 542.91:546.171.5'161:547.1'118

### REACTION OF TETRAFLUOROHYDRAZINE WITH ORGANIC COMPOUNDS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 8, Aug 82 (manuscript received 1 Dec 81) pp 1812-1820

FOKIN, A. V. and STUDNEV, Yu. N., Institute of Heteroorganic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences, Moscow

[Abstract] To answer increased interest in organic compounds with an NF bond for medicinal and bactericidal uses, study was made of highly-electrally-negative groups with an oxidizing characteristic, contrasting them to inert and stable perfluoroalkanes, perfluoroalkylamines and fluoropolymers. Continuing their previous review (Moscow, Khimiya, 1978), the authors review the literature on tetrafluorohydrazine in synthesis of derivatives with the nitrogen-fluorine bond, N-F attachment to unsaturated alkenes and olefins, processing with conjugated and unconjugated dienes to form poly(difluoroamino) alkanes and alkenes, substitution of halogens and hydrogen atoms through TFAH action to synthesize NN-difluoroallylamine from allyl bromide, reactions with oximes and with ilides of phosphorus and ammonia. While the research done so far has shown the potential of these compounds, the authors regard it to be in its initial stages only. References 59: 41 Russian, 18 Western.

[342-12131]

UDC 541.491.6.0/547.991.4:547.333.2

### REACTIONS OF ORGANIC THIOCYANATES WITH NUCLEOPHILE REAGENTS. REPORT 3. SYNTHESIS OF SUBSTITUTED CYANAMIDES FROM THIOCYANATES AND AMINES

Leningrad ZHURNAL OBŞHCHEY KHMII in Russian Vol 52, No 8, Aug 82 (manuscript received 12 Oct 81) pp 1813-1815

RYBIN, A. G., ZIL'BERMAN, Ye. N., TRACHENKO, V. I. and SOTNIK, A. M., Dzerzhinsk Branch, Gorkiy Polytechnical Institute imeni A. A. Zhdanov

[Abstract] Previously the authors showed (this journal, Vol 51, p 2571) that one product of the reaction of ethyl cyanate and piperidine was N-cyanopiperidine. Since substituted cyanamides are used to make useful insectofungicides

and medications, the authors sought in the present study to direct the reaction of alkylthiocyanates and amines in the direction of such cyanamides. Results showed that in the presence of oxides of zinc, mercury and cadmium this goal was achieved. To confirm the structure of compounds obtained from N-cyanopiperidine, they synthesized 1,1-pentamethylurea, and from N-cyanomorpholine, the thiocyanate of 1,1,3,3-bis(oxydiethylene)guanidine. Chemical procedures are summarized in the experimental section. References 8:  
3 Russian, 5 Western.  
[334-12131]

UDC 543.422:542.61

SOLVATION OF THIAZOL AZOCOMPOUNDS WITH ORGANIC SOLVENTS AND ITS ANALYTICAL USE

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 37, No 8, Aug 82  
(manuscript received 18 Jun 81) pp 1406-1415

RUDOMENTKINA, T. F. and IVANOV, V. M., Moscow State University imeni M. V. Lomonosov; "Avtozil" Production Association

[Abstract] The authors had previously discussed the effects of acetone, ethanol, dioxane and dimethylformamide on electron spectra of 7-(2-thiazolylazo)-8-hydroxyquinoline-5-sulfo acid (TAOQ) and 4-(2-thiazolylazo)-resorcin (TAR), showing that while reactivity of the former rose sharply with increasing concentrations, the opposite occurred with TAR. In the present study, the methoxy derivative of TAOQ, a fixed azoide form and the fixed form of TAR, which is incapable of tautomerization involving the p-epoxy group, were studied. Experimental procedures and spectral findings are summarized. Results showed the two-component nature of TAOQ in various hydroorganic media. The spectrum of the methoxy derivative showed distinct differences in hydro-acetone media from that of TAOQ. In various concentrations of the indicated organic solvents, it was shown that increasing their concentration consistently produced greater amounts of the reactive azoide form of the reagent. Both TAR and its methoxy derivative were most affected by acetone, and studies of their spectra concentrated on the use of this solvent. The reactivity of TAR in hydroorganic media was influenced by a shift in the direction of the quinoid form which determined its reduced reactivity. Figures 5; references 19: 14 Russian, 5 Western.  
[337-12131]

UDC 543.42.062:546.171.5

PHOTOMETRIC DETERMINATION OF HYDRAZIDES OF DIBASIC CARBOXYLIC ACIDS BY  
REACTION WITH NITROUS ACID

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 37, No 8, Aug 82  
(manuscript received 9 Apr 81) pp 1511-1514

VESELOV, V. Ya., GREKOV, A. P. and KACHOROVSKAYA, O. P., Institute of  
High-Molecular Compound Chemistry, UkrSSR Academy of Sciences, Kiev

[Abstract] The title hydrazides are widely used, in producing plastics, as monomers and catalysts, as well as in synthesis of organic preparations and in medicine. Methods for measuring them are unsatisfactory where small and trace amounts are involved; the authors studied spectrophotometric reactions of dibasic carboxylic acids (DCA) with nitrous acid, and photometric measurement with excess nitrous acid using Rivanol. Comparison of electron spectra of aqueous and acidified DCA and that treated with nitrous acid shows distinct differences. With  $\text{NaNO}_2$ , DCA reacts to form azides in an acid medium at room temperature with excess  $\text{NaNO}_2$  and decomposition. The tests made it possible to establish a test for DCA, requiring 5-15 minutes, with  $\text{HNO}_2$  being detected in either weakly or strongly acidic media. In contrast to the diazometric potentiometer titration test, the proposed method gives stable results regardless of the concentration of initial reagents and the quantity of methylene bonds and aliphatic chains of DCA. Quantities of  $\leq 0.01$  M can be detected, with mean standard deviation of about 2%. Figures 3; references 14: 11 Russian, 3 Western.

[337-12131]

UDC 547.057+547.021/022

SYNTHESIS OF AMIDRAZONE SALTS BY REACTION OF S-METHYLTHIOAMIDES OF IODIDES  
WITH HYDRAZINES

Leningrad ZHURNAL ORGANICHESKOY KHIMII in Russian Vol 18, No 8, Aug 82  
(manuscript received 9 Oct 81) pp 1613-1618

ZELENIN, K. N., PINSON, V. V. and KHRUSTALEV, V. A., Military Medical Academy  
imeni S. M. Kirov, Leningrad

[Abstract] Current methods for synthesizing amidrazone have various structural limitations and are accompanied by formation of side products. The range of hydrazine derivative are studied to determine the nature of their reactions with iodide S-methylthioamides of various substitution levels. The reaction took place without heating and produced the desired compounds with hydrazine, phenylhydrazine and 1,1-dimethylhydrazine. For monosubstituted hydrazine the possibility of structural isomers following reactions at the  $\text{N}^1$  or  $\text{N}^2$  atoms was studied using PMR spectroscopy. Increasing the steric volume of the substituent in the hydrazine component in transition from

methyl- to ethyl- and propylhydrazine was accompanied by partial reaction in the unsubstituted nitrogen atom, with 10-15% mono-substituted acetamidrazone of iodides forming. Reactions with these amides were regarded to be universal means for synthesizing amidrazone salts with high yields. Procedures are summarized in the experimental section. References 15: 8 Russian, 7 Western. [341-12131]

UDC 547.3+547.79

REACTION OF DIACETYLENE COMPOUNDS WITH BENZYL AZIDE. REPORT 2. RING ATTACHMENT OF BENZYL AZIDE TO SEPARATED AND CONJUGATED DIACETYLENES

Leningrad ZHURNAL ORGANICHESKOY KHIMII in Russian Vol 18, No 8, Aug 82  
(manuscript received 26 Oct 81) pp 1619-1623

TIKHONOVA, L. G., SEREBRYAKOVA, Ye. S. and VERESHCHAGIN, L. I., Institute for Petroleum and Coal Chemical Synthesis, Irkutsk State University imeni A. A. Zhdanov, Angarsk

[Abstract] In a previous work (this journal, Vol 17 p 141) the authors showed that conjugated diacetylene compounds with a final triple bond react more slowly with benzyl azide than those with a final single bond. In the current study they considered reactions of the title compounds in which the final triple bond was separated by alkyl or aryl fragments. Attachment of benzyl azide to disubstituted 1,5-diphenyl-1,4-pentadien-3-ol where a simultaneous azide attack on both double bonds took place was also studied; here the products were 1,2,3-triazolylalkane(arene) and ditriazolylcarbanol. Contrary to expectation, the related reaction of diethynylketone with benzyl azide together with the diadduct brought formation of the monoadduct 1-penyl-3-[1-benzyl-4-phenyl-1,2,3,-triazol-5(4)-y]-1-propine-3-on. Spectral analyses were inconclusive. Apparently the attachment of benzyl azide at the triple bond closest to the carbonyl most commonly has the structure 1-benzyl-4-benzoyl-5-phenylethynyltriazol. Procedures are summarized in the experimental section. References 7: 4 Russian, 3 Western.

[341-12131]

ORGANOMETALLIC COMPOUNDS

UDC 546.18.16.22

PHENOXYFLUORIDES OF PHOSPHORUS V, ARSENIC V AND ANTIMONY V

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 266, No 1, Sep 82  
(manuscript received 25 May 82) pp 123-126

IL'IN, Ye. G., KALOV, U., KOLDITZ, L., academician, GDR Academy of Sciences  
and BUSLAEV, Yu. A., corresponding member, USSR Academy of Sciences,  
Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, USSR  
Academy of Sciences, Moscow

[Abstract] Previously, of the phenoxyfluorophosphoranes  $\text{PF}_{5-n}(\text{OPh})_n$ , only  $\text{PF}_2(\text{OPh})_3$  has been identified. The authors used the reactions of pentafluorides of the title elements with phenol in acetonitrile to obtain phenoxyfluorophosphoranes, as well as the title compounds. The discovery of  $\text{PF}_4\text{OPh}$  suggested that conducting the reaction in milder conditions such as by adding phenol dissolved in a non-polar solvent would lead to higher yields. Results showed that substituting a fluorine atom into pentaluoro-complexes  $\text{PF}_5\text{CH}_3\text{CN}$  and  $\text{AsF}_5\text{CH}_3\text{CN}$  led to reducing the coordination number in the products  $\text{PF}_4\text{OPh}$  and  $\text{AsF}_4\text{OPh}$ . In the case of  $\text{SbF}_5\text{CH}_3\text{CN}$ , substituting the fluorine atom by a phenoxy group left the coordination number at six. This suggests an increase in the valency basis of the central ion due to a decrease in the energy differential of s, p and external d-orbitals. Figures 2; references 13: 2 Russian, 11 Western.

[1-12131]

## ORGANOPHOSPHORUS COMPOUNDS

UDC 541.6:541.124:547.1'118:547.413:546.16

### STRUCTURE AND REACTION MECHANISMS OF SOME PHOSPHORO- AND FLUOROORGANIC COMPOUNDS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 8, Aug 82 (manuscript received 1 Dec 81) pp 1749-1758

FOKIN, A. V. and LANDAU, M. A., Institute of Heteroorganic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences, Moscow; Scientific Research Institute for Biological Testing of Chemical Compounds, Moscow Oblast

[Abstract] The authors review their research on the title reactions which employed theoretical and experimental physicochemical methodology, particularly quantum chemical calculation of molecules involving self-congruent field methods in approaching an isolated molecule. Experimental data were obtained chiefly from  $^{19}\text{F}$  and  $^{31}\text{P}$  NMR and other spectral methods. Reactivity and reaction mechanisms are reviewed for fluoroolefins, tetra- and pentacoordinated phosphorus compounds. Hydrogen halides were found to attach to fluoroethylenes according to the Markovnikov principle, and fluoroolefins showed a vinyl substitution reaction that distinguished them from the fluoroethylenes. Fluorophosphoranes underwent alkaline hydrolysis at an ascending rate for  $\text{F}_2\text{PR}_3$ ,  $\text{F}_3\text{PR}_2$  and  $\text{F}_4\text{PR}$ . Theoretical and experimental physicochemical parameters of molecules were in agreement, but due to shortcomings of the computers used, nonempirical and semiempirical results could not always be compared.

References 21: 18 Russian, 3 English.

[342-12131]

UDC 542.91:547.1'118

### REACTION OF DI- AND TRICYANIDES OF PHOSPHORUS WITH CARBONYL COMPOUNDS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 8, Aug 82 (manuscript received 29 Jun 81) pp 1884-1885

PUDOVIK, A. N., ROMANOV, G. V. and VOLKOVA, V. N., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, of the Kazan Branch, USSR Academy of Sciences

[Abstract] A study is reported of the reactions of the title cyanides with the ester and nitrile of pyroracemic acid, and with aldehydes and ketones.

Catalyzed by triethylamine, these reactions led to the formation of alpha-cyano-substituted derivatives of phosphorous acid. The structure of the compounds produced was confirmed by elemental analysis, and infra-red, Raman and NMR spectra. Apparently these reactions went through an intermediate stage in which cyanohydrins formed, which then reacted with phosphorus cyanides in a nucleophile substitution type of reaction. Reactivity of phosphorus cyanides was found to decrease in direct correlation with the substitution of nitrile groups at the phosphorus of alkoxy radicals.

References 2 Western.

[342-12131]

UDC 547.128

#### OXIDATION OF HYDROQUINONE PHOSPHATE BY HYDROGEN PEROXIDE IN PRESENCE OF COPPER IONS

Leningrad ZHURNAL OBSHCHEY KHMII in Russian Vol 52, No 8, Aug 82  
(manuscript received 16 Jul 81) pp 1731-1/36

MURADOV, A. Z. and YASNIKOV, A. A., Institute of Organic Chemistry, UkrSSR Academy of Sciences

[Abstract] Study of the consecutive stages in oxidation phosphorylation is a major problem of bioorganic chemistry, which is addressed both through biochemistry and through study of chemical models. Oxidation of quinolophosphates can be regarded as a possible model for charged oxidation phosphorylation. Spectral methods and thin layer chromatography have been used successfully to observe quinone formation in the system, which speeds oxidation. This function depends on the  $Cu^+$  ion. Of two possible paths for affecting the complex former, the reaction with the hydroxyl radical or the bonding of  $Cu^+$  in an inactive complex, the authors propose that the latter is involved. This has been confirmed by tests under anaerobic conditions with argon as the medium. Both a slow reaction leading to  $CuO^+$  and a rapid oxidation of hydroquinone phosphate by the  $CuO^+$  ion occur. The reaction is speeded by the quinone, semiquinone or an ion of bivalent copper, which functions as the acceptor of an electron during oxidation by the hydroxyl radical. Figures 5; references 11: 7 Russian, 4 Western.

[334-12131]

## PHOSPHORYLATION OF PROPARGYL ETHERS AND SUBSTITUTED ALLENES BY PHOSPHORUS PENTACHLORIDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 8, Aug 82  
 (manuscript received 12 Feb 82) pp 1746-1750

ROZINOV, V. G., KOLBINA, V. Ye., GLUKHIKH, V. I., LYASHENKO, G. S., FILIPPOVA, A. Kh. and GLUKHIKH, N. G., Irkutsk Institute of Organic Chemistry, Siberian Division, USSR Academy of Sciences; Institute of Petroleum and Coal Chemistry Synthesis, Irkutsk State University

[Abstract] While reactions of phosphorus pentachloride with aryl- and alkyl-acetylenes have received much attention, functionally substituted acetylenes other than alkoxy- and aroxyacetylenes have not been studied in such reactions. Therefore, the authors studied the title reaction with  $\text{CH}=\text{CCH}_2\text{X}$ , where  $\text{X}=\text{Cl}$ ,  $\text{OMe}$  or  $\text{OPh}$ , which led to formation of organyltrichlorophosphonium hexachlorophosphates with the initial hydrocarbon skeleton being preserved. Yields ranged from insignificant for propargylchloride to 14% for phenylpropargyl ether. Treating the latter with  $\text{SO}_2$  produced a mixture of dichloroanhydride of 1-phenoxy-2,3,3-trichloropropyl-2-phosphonic acid and a variant with  $\text{POCl}_2$ . Recrystallization brought isolation of dichloroanhydride of the phosphonic acid, whose structure was confirmed by  $^1\text{H}$ ,  $^{13}\text{C}$  and  $^{31}\text{P}$  NMR. A surprising feature was the slight chlorination of the initial product of the attachment of  $\text{PCl}_5$  on the triple bond of propargyl ethers and propargylchloride during phosphorylation, as well as the ready loss of RO groups in mild reactions. Study of the behavior of phenoxyallene in analogous conditions showed that it was readily phosphorylated by the title compound, forming crystalline organyltrichloro-phosphonium of hexachlorophosphate, which converted to dichloroanhydride of 1-phenoxy-3-chloro-1-propenyl-2-phosphonic acid when processed with  $\text{SO}_2$ . Thus it behaved like vinyl ethers, with phosphorus entering the molecule at the beta-position. Procedures are given in the experimental section. Figure 1; references 6: 5 Russian, 1 Western.

[334-12131]

## STRUCTURE, ACID-BASE AND COMPLEX-FORMATION PROPERTIES OF N-PHOSPHORYLATED THIOBENZAMIDES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 8, Aug 82  
 (manuscript received 16 Nov 81) pp 1776-1785

ZIMIN, N. G., LAZAREVA, G. A., SAVEL'YEVA, N. I., ISLAMOV, R. G., ZABIROV, N. G., TOROPOVA, V. F. and PUDOVIK, A. N., Kazan State University imeni V. I. Ul'yanov-Lenin

[Abstract] Continuing previous study of phosphoryltropic tautomerism (this journal, Vol 49 p 2621) the authors studied the nature of association,

tautomeric capacity and title properties of the title compounds, using infrared and  $^{31}\text{P}$  NMR spectroscopy. Effects of reduction in thioamide concentration and temperature variations on spectra are described. Results indicate that condensed and concentrated solutions in  $\text{CCl}_4$  of the compounds were associated by a polymer intermolecular bond of hydrogen involving NH and the P=S groups. With equal possibility of 1,3-migration of the proton or the thiophosphoryl group, a dynamic balance between compounds was obtained. To explain the effects of phosphorus-containing grouping, complex-formation of thiobenzamide in selected conditions was studied, and a chelate structure identified. Elemental analysis showed that the composition of isolated and dissolved complexes coincided. Protons were expelled during the formation of durable chelates and the reaction center shifted, with C=S and P=S (P=O) groups taking part in complex-formation. Procedures are given in the experimental section. Figures 5; references 13: 10 Russian, 3 Western.  
[334-12131]

UDC 547.1'118

#### ANHYDRIDES OF ORGANYLPHOSPHONIC ACIDS AND THEIR THIOANALOGS

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 52, No 8, Aug 82  
(manuscript received 6 Oct 81) pp 1785-1792

ANDREYEV, N. A. and GRISHINA, O. N., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan Branch, USSR Academy of Sciences

[Abstract] Among organic anhydrides of acids with tetracoordinated phosphorus atoms, only dithiophosphonic acids have been studied thoroughly, and no concensus has been reached about their structure. Hence the authors studied the structures of such anhydrides obtained by various methods such as reactions of phenylphosphine with sulfur monochloride and thiolysis of dichlorothiophosphonates to obtain alkyl-, cycloalkyl- and phenyldithiophosphonic acids. Monochloroanhydrides of dithiophosphonic acids with initial dichloroanhydrides can form dichloroanhydrides of pyrothiophosphonic acid that through acidolysis of  $\text{H}_2\text{S}$  and HCl convert into mono- and dichloroanhydrides of thiophosphonic acids. These compounds were unstable. Ethyldithiophosphonic acids also produced corresponding anhydrides, which in thiolysis led to ethyltrithiophosphonic acid, so that the initial anhydride can be regarded to be either a thioanhydride of ethyltrithiophosphonic acid or an anhydride of ethylperthiophosphonic acid. In the transition from anhydrides of organylphosphonic acids to their thioanalogs, the ring dimensions decrease. Chemical procedures and NMR spectra results are given in the experimental section. References 23: 10 Russian, 13 Western.  
[334-12131]

UDC 547.341

SYNTHESIS OF AMIDES, AMIDOESTERS AND DIESTERS OF 2-METHYL-1,3-BUTADIENE(THION) PHOSPHONIC ACIDS

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 52, No 8, Aug 82  
(manuscript received 10 Dec 81) pp 1793-1803

PRORUBSHCHIKOV, A. Yu., KUZINA, N. G., LYKOV, A. D., RESHETOV, P. N., MASHLYAKOVSKIY, L. N. and IONIN, B. I., Leningrad Technological Institute imeni Lensovet

[Abstract] While the title compounds and their analogs may have practical application, little research has been done involving them. The authors synthesized the title amides by conducting reactions of corresponding dichloroanhydrides with ammonia, primary or secondary amines. While the reaction progressed smoothly in benzene, diethyl or petroleum ether, there was a sharp drop in reactivity of thionphosphates in nucleophile substitution. Complete reaction required prolonged heating at 60-70°C. Structures of the compounds produced were confirmed by infrared and  $^1\text{H}$ ,  $^{31}\text{P}$  and  $^{13}\text{C}$  NMR spectroscopy. Carbon 13 spectra showed the presence of two isomers due to variations of the polar effect of groups containing phosphorus in  $\text{E}$ - and  $\text{Z}$ -isomers. Further study related this phenomenon to varying compositions of the products of decomposition of pentachloride complexes of phosphorus with isoprene, hydrogen sulfide and sulfuric anhydride. Figures 4; references 9: 8 Russian, 1 Western (US patent).

[334-12131]

UDC 547.241

AMIDES OF 2-DIOXYNYPHOSPHONOUS ACID

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 52, No 8, Aug 82  
(manuscript received 14 Oct 81) pp 1808-1813

NURTDINOV, S. Kh., TSIVUNINA, I. V., KHAYRULLIN, V. K. and ZARIPOVA, V. G., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan Branch, USSR Academy of Sciences; Kazan Chemicotechnological Institute imeni S. M. Kirov

[Abstract] Continuing earlier studies of conversions of 2-dioxenyldichlorophosphine (this journal Vol 51, p 309, 331), the authors studied its reaction with certain secondary amines, and learned that the reactive mass contained significant quantities of chloroanhydridoamides of the title acid as products of substitution of a single chlorine atom in the initial dichloroanhydride; reduced reactivity was also noted. Further details of the reactions are given. Anomalous chemical shifts for  $\text{P}^{III}$  indicated a supplemental coordination of the phosphorus atom by two thion atoms. Synthesized phosphorylated

derivatives of dialkyldithiocarbamic acids were shown to be effective small quantity additives to vulcanized resins with various purposes such as retarding vulcanization at the mixing stage, accelerating vulcanization during rubber structuring and preventing oxidation during use. Chelate bonds were stable at rolling temperature (below 120°C), thus eliminating subvulcanization. Chemical procedures are summarized in the experimental section. References 5 Russian.

[334-12131]

UDC 547.819/822.3

#### NEW BICYCLIC AZAPHOSPHORINANONES

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 52, No 8, Aug 82  
(manuscript received 15 Feb 82) pp 1919-1920

BUTIN, B. M., ISAYEVA, G. M., IL'YASOV, R. N. and YERZHANOV, K. B., Institute of Chemical Sciences, KaSSR Academy of Sciences

[Abstract] The reaction of cycloattachment involving unsaturated ketones and substituted phosphines has achieved wide popularity for synthesizing derivatives of phosphorinanones. The authors have shown for the first time the possibility of cyclization of dehydropiperidyl ketones by phenylphosphine, producing bicyclic compounds containing heteroatoms of nitrogen and phosphorus. Chemical procedures are summarized. Results suggest the existence of each ketone in two isomeric forms with non-equivalent positioning of the phenyl group.

References 2: 1 Russian, 1 Western.  
[334-12131]

UDC 547.241

#### SYNTHESIS OF 5-SUBSTITUTED FURFURYLPHOSPHONATES

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 52, No 8, Aug 82  
(manuscript received 18 Feb 82) pp 1920-1921

PEVZNER, L. M., IGNAT'YEV, V. M. and IONIN, B. I., Leningrad Technological Institute imeni Lensoveta; All-Union Scientific Research Institute for Hydrolysis of Plant Materials

[Abstract] Until recently, only 5-nitrophosphonate among the title compounds had been described. To develop methods for synthesis and study of C-H acidity of furfurylphosphonates, the authors produced several such substances by the Michaelis-Bekker reaction from 5-methylhalide derivatives and by acylation of furfurylphosphonate. The structure of the products was confirmed by PMR and infrared spectroscopy. Chemical procedures are summarized. References 2: 1 Russian, 1 Western.  
[334-12131]

UDC 547.34

CYCLIZATION OF DICHLOROANHYDRIDES OF 1,3-ALKADIENE-1-PHOSPHONIC ACIDS WITH FORMATION OF 1-OXOPHOSPHOLENES

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 52, No 8, Aug 82  
(manuscript received 8 Feb 82) pp 1922-1923

BREL', V. K., IONIN, B. I. and PETROV, A. A., Leningrad Technological Institute imeni Lensoveta

[Abstract] Dichloroanhydrides of 2-chloro-1,3-alkadiene-1-phosphonic acids are known to be rather stable compounds that can be isolated by distillation in a vacuum. The authors established that heating, when a tert-butyl electron donor has been included in the reaction mixture, leads to a previously unknown intra-molecular cyclization and formation of 1,2,3-trichloro-2-alkyl-4-tert-butyl-1-oxophospholene-3. Their structure was confirmed by infrared, PMR and  $^{31}\text{P}$  NMR spectroscopy. Chemical procedures are summarized. Reference 1 Russian.

[334-12131]

UDC 547.241

NEW METHODS FOR SYNTHESIZING PHOSPHENES

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 52, No 8, Aug 82  
(manuscript received 16 Feb 82) pp 1925-1926

MARKOVSKIY, L. N., ROMANENKO, V. D. and PIDVARKO, T. I., Institute of Organic Chemistry, UkrSSR Academy of Sciences

[Abstract] Presently such interest is being devoted to synthesis and study of properties of compounds with a P=C bond. The authors report on new methods for synthesizing aminophosphenes by reaction of dialkylhalide amines with silylphosphines. The tests were at room temperature or with slight (40-60°C) heating, with no solvent or in acetonitrile. The structure of the products was confirmed by  $^{31}\text{P}$ ,  $^{13}\text{C}$  and  $^1\text{H}$  NMR, cryoscopy to determine molecular weight, and element analysis. The product bis(N,N-dimethylamino)methylidene-P-trimethylsilylphosphine, with a highly reactive P-Si bond, is also of interest as an intermediate product in forming new compounds with bicoordinated phosphorus. Chemical procedures are summarized. References 2 Western.

[334-12131]

UDC 547.341

BREAKING P-C BOND IN DIALKYL-1-PHENYL-2-BROMOVINYLPHOSPHONITES THROUGH  
EFFECTS OF SODIUM ALCOHOLATES

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 52, No 8, Aug 82  
(manuscript received 9 Mar 82) pp 1926-1927

TRISHIN, Yu. G., PESKHOV, A. F., MAYOROVA, Ye. D., PLATONOV, A. Yu. and  
CHISTOKLETOV, V. N., Leningrad Technological Institute of the Cellulose and  
Paper Industry

[Abstract] The authors established the unusual course of the reaction of  
dialkyl esters of 1-phenyl-2-bromovinylphosphonous acids with sodium  
alcoholates, interpreted as a nucleophile substitution at the phosphorus  
atom. The P-C bond was broken and high yields of full esters of phosphonous  
acid, phenylacetylene and sodium bromide were obtained. This reaction is  
contrasted to similar ones where other results such as ester interchange or  
intermediate stages occur. Gas-liquid chromatography was used for quantitative  
identification of the substances formed. References 3: 1 Russian, 1 Polish,  
1 Western.  
[334-12131]

UDC 547.341

REACTION OF ADDUCTS OF PHOSPHORUS PENTACHLORIDE AND ALKYL VINYL ETHERS WITH  
DIMETHYLSULFOXIDE

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 52, No 8, Aug 82  
(manuscript received 9 Feb 82) pp 1927-1928

MITRASOV, Yu. N. and KORMACHEV, V. V., Chuvash State University imeni  
I. N. Ul'yanov

[Abstract] Reactions of the title adducts and olefins with several oxygen-  
containing compounds resulting in dichloroanhydrides of phosphonic acids have  
been reported. The authors found that in the title reaction dimethylsulfoxide  
brought formation of 2-chloro-2-alkoxyethyl- and 2-alkoxyvinylphosphonic  
acids. Chemical procedures are summarized. The structure of the products  
were established by  $^{31}P$  NMR. References 4 Russian.  
[334-12131]

PHOSPHORYLATION OF INDOLINES INTO BENZENE NUCLEUS

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 52, No 8, Aug 82  
(manuscript received 9 Mar 82) pp 1928-1929

GUREVICH, P. A., RAZUMOV, A. I. and STEPANOV, P. A., Kazan Chemicotechnological Institute imeni S. M. Kirov

[Abstract] Only one example of indolines with a phosphoryl group containing a P-C bond in a benzene nucleus has previously been described. In their work on synthesizing phosphorylated indoles the authors studied phosphorylation of 1-methylindoline by phosphorus trichloride and certain conversion of the products of the reaction. Chemical procedures and structural analysis by NMR are summarized. References 3 Russian.

[334-12131]

## PESTICIDES

UDC 547.785.5.631.811.98.542.953

### SYNTHESIS OF POTENTIAL PESTICIDES BASED ON AMINO-COMPOUNDS AND BETA-TRICHLOROMETHYL-BETA-PROPIOLACTONE

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 3, May-Jun 82  
(manuscript received 9 Jan 81) pp 40-43

KASYMOVA, K., SHAZHENOV, A. A. and MAKSDOV, N. Kh., Tashkent Order of Labor's Red Banner Institute for Engineers of Irrigation and Agricultural Mechanization

[Abstract] Among anilides and amides of carboxylic acids having varying biological activity, derivatives of halide-carboxylic acids were of particular interest to the authors, who synthesized several derivatives of 4,4,4-trichloro-3-hydroxybutyric acid in reactions with the title compounds. The reactions were conducted in boiling equimolar quantities for 3 hours in a reflux condenser. High yields were obtained with morpholine, hexamethylene imine, allylamine and o-anisidine; this is tied to their high alkalinity, but similarly basic anilines did not react with the same high yields, or with the same ease. The structures of the compounds produced were verified by infrared spectroscopy, mass spectrometry and element analysis. Initial testing as herbicides and fungicides has shown positive results, and tests are being continued. References 9: 8 Russian, 1 German.

[328-12131]

UDC 661.54(088.8)

### PHYSICOCHEMICAL BASES AND TECHNOLOGY OF DEFOLIANT CYANAMIDE + CALCIUM SALTPETER

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 3, May-Jun 82  
(manuscript received 19 Nov 80) pp 48-52

DZHAPPAROV, A., SHAMMASOV, R. E., YUNUSOV, D. Kh. and TUKHTAYEV, S., Chemical Institute, UzSSR Academy of Sciences

[Abstract] Since the effectiveness of defoliants has been shown to increase with the addition of hygroscopic substances, the authors sought to develop a defoliant using calcium nitrate, which both increased effectiveness and

stabilized the product. To remedy the problem of incomplete hydrolysis and small amounts of free cyanamide, the authors made the title compound through hydrolysis of commercial calcium cyanamide with  $\text{Ca}(\text{HCN}_2)_2$  separating into the solution and subsequent removal of residue and neutralization with nitric acid. The authors' method provided for low-cost production of aqueous solutions of free cyanamide containing a strong hygroscopic component  $\text{Ca}(\text{NO}_3)_2$  that stabilized the cyanamide in the optimum pH range of 4.5-5.5. In production, traces of acetylene were emitted into the atmosphere. The product was found to be effective in defoliating cotton before harvest. Figure 1; references 10 Russian.

[328-12131]

UDC 547.241+547.789

#### PHOSPHORYLATED DERIVATIVES OF 3-HYDROXYMETHYL BENZOTHIAZOLINE-2-THIONE

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 3, May-Jun 82  
(manuscript received 11 Feb 81) pp 62-63

MAKHAMATKHANOV, M. M. and BAKHTIYAROV, F. A., Tashkent Order of Labor's Red Banner Institute of Engineers of Irrigation and Agricultural Mechanization

[Abstract] The authors hypothesized that phosphorylating benzothiazoline-2-thione would increase the defoliating effect of 2-alkylthiobenzothiazoles, but the reaction of chloroanhydride of diethylphosphoric acid with the potassium salt of 2-benzothiazoline-2-thione in boiling toluene produced 2-ethylthiobenzothiazole. The authors obtained the desired product through the reaction of chloroanhydrides of N-alkyl(aryl) amidophosphorous acids with 3-hydroxymethylbenzothiazoline-2-thione at 0-5° C in a benzene solution in the presence of triethylamine. Element analysis, thin-layer chromatography and infrared spectra confirmed the structures of the compounds produced. The defoliant activity of chloromethylphosphonic acid derivatives was greater than that of derivatives of phenylphosphorous acid. References 3 Russian.  
[328-12131]

UDC 543.544.45:547.551

#### ASSAYING PHENYL CARBAMIDE HERBICIDES BY GAS-LIQUID CHROMATOGRAPHY

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 37, No 8, Aug 82  
(manuscript received 6 May 81) pp 1494-1501

KIRICHENKO, V. Ye., KULIKOVA, G. S. and PASHKEVICH, K. I., Institute of Chemistry, Urals Scientific Center, USSR Academy of Sciences, Sverdlovsk

[Abstract] Various assay methods for the title herbicides have included direct chromatography, chromatography of products of hydrolysis of phenyl

carbamides, aromatic amines, chromatography of derivatives of those amines and of derivatives of phenyl carbamides. The authors evaluated the first three using anilides of polyfluorocarboxylic acids with good volatility, thermal stability and electron-capture properties. The detector of constant recombination rate used was found to be more sensitive to pathoran and maloran with a bromine atom than to compounds with a chlorine atom, and was twice as sensitive to the former as to other tested compounds. The tests indicated that analysis of derivatives of polyfluorocarboxylic acids was much superior to the other variants of gas-liquid chromatography tested in both of identification possibilities and sensitivity. Chromatograms of diuron and linuron with end groups of the aromatic chain and their corresponding 3,4-dichloroaniline and its variant form 3,4-dichloroanilide of 3-trifluoromethoxy-2,2,3,3-tetrafluoropropionic acid (MFP) showed the advantages gained by fluoroacetylation. The experiments made it possible to develop group methods for assaying herbicides with substituted phenyl carbamides in aqueous media, in soils, vegetables and plant green mass, with minimum detection of 0.002 mg/l in water and 0.02 mg/kg in soils or plant materials. Procedures are summarized in the experimental and methodology sections. Figures 5; references 20: 7 Russian, 13 Western.

[337-12131]

## PETROLEUM PROCESSING TECHNOLOGY

### ROLE OF NEW PETROLEUM REFINING PLANT IN KIRISHI

Moscow GUDOK in Russian 23 Sep 82 p 4

[Article by B. Volyanyuk, chief engineer of the "Kirishineftorgsintez" production association: "SEV: Integration in Action--Kirishi Is Object of Composition of Forces"]

[Text] (APN)--The village of Kirishi, located 100 kilometers from Leningrad, appeared on the economic map of our country just recently--when the largest petroleum refining plant in the northwest section of the Russian Federation was put into service. It is a city already and its pride is the plant which was greatly needed by the entire region, especially industrial Leningrad. Economists have estimated that construction of a petroleum refining enterprise in the country's northwest will provide a saving of tens of millions of rubles per year on fuel transport alone.

The entire country participated in the construction of the plant. Taking into consideration its importance in the national economy, the Komsomol Central Committee declared the construction site an All-Union Leading Komsomol Youth Work Site. Thousands of young men and women came here from all over the country. More than 500 enterprises and organizations from different cities provided up-to-date technical work at the construction site.

Today the Kirishi petroleum refining plant is one of the greatest objects of Soviet petroleum technology, providing the country with more than 20 different petroleum products and producing in essence all types of motor fuel. Fraternal nations--members of SEV [Council of Mutual Economic Aid]--also took part in its construction. The GDR sent an apparatus for hydro-purification of diesel fuels. Operators note its high quality and ease of operation. Our German friends also sent a device for benzene reforming which aids in preparation of benzene and toluol--valuable raw materials in the petrochemical industry.

A device made in the GDR for obtaining liquid paraffins by the so-called "Pareks" method has great significance for the national economy. It is a gigantic combination of structures including a tall heating oven, production shops, collection vats and reservoirs, united by a system of pipes with a total length of more than 150 kilometers. This device completely guarantees a supply of raw materials to the biochemical factory here in Kirishi. Paraffins help solve the problem of obtaining livestock fodder: the Kirishi Biochemical Factory produces protein-vitamin concentrates. It should be pointed out that the equipment for obtaining liquid paraffins by the "Pareks" method is distinguished by high productivity and a high degree of automation.

Machine constructors from the CFSR also took part in equipping the enterprise with the newest technology. They provided two devices for catalytic reformation of benzine, which permitted an increase in the octane characteristics of this fuel. Recently benzine I-93, a fuel for "Zhiguli" and "Volga" automobiles, was put into production using the Czechoslovakian equipment.

Technological equipment of various types was sent by Bulgaria, Hungary, and Poland. A Polish-made computer, for example, made it possible to control properly the most important technological processes.

Kirishi petrochemists are making a valuable contribution to strengthening the country's fuel-energy base. In the current five-year plan they are expected to increase output of products that are needed in many branches of the national economy. Machine constructors from fraternal countries are cooperating with them and helping them accomplish this task.

9967

CSO: 1841/14

UDC 542.943:542.978

MECHANISM OF ANTIOXIDANT ACTION: MODERN CONCEPTS

Moscow NEFTEKHIMIYA in Russian Vol 32, No 4, Jul-Aug 82 pp 435-447

EMANUEL', N. M., Institute of Chemical Physics, USSR Academy of Sciences

[Abstract] This is a review of knowledge of antioxidants for hydrocarbons, mineral oils, polymers, food products and medical preparations. Study of elementary stages of inhibiting oxidation has used such physicochemical methods as chemiluminescence, electron spin and nuclear magnetic resonance, impulse photolysis and chemical polarization of nuclei. Effective antioxidants discussed include phenols and aromatic amines, nitroxyl radicals and phenoxy radicals. Side reactions that complicate inhibitor effectiveness are discussed. Computers are being used in testing and selecting inhibitors. The synergistic effect whereby the combined effect of two inhibitors is greater than that of each separately has been analyzed mathematically and tested experimentally; an example is the combined effect of ethyl benzene in the presence of CuSt<sub>2</sub> [copper stearate] and substituted amines. Critical phenomena in liquid phase oxidation include degenerative branching chain reactions in the presence of an inhibitor and the appearance of more than one durable stationary state in an open system. Recently these phenomena have also been observed in non-chain radicals, merely through generation of two types of active radicals (RO<sup>·</sup> and r') that differ in their reactivity with PhOH. The final type of oxidation inhibition discussed is that involving metal complexes of transitional metals, such as selenides. Figures 8; references 40: 38 Russian, 2 Western.  
[335-12131]

UDC 54.024:542.943:542.978

RELATIVE ACTIVITY OF  $R^{\cdot}$  AND  $RO_2^{\cdot}$  RADICALS OF HYDROCARBONS IN REACTIONS WITH INHIBITORS OF OXIDATION PROCESSES

Moscow NEFTEKHIMIYA in Russian Vol 22, No 4, Jul-Aug 82 pp 458-463

MAZALETSKAYA, L. I., KARPUKHINA, G. V. and EMANUEL', N. M., Institute of Chemical Physics, USSR Academy of Sciences

[Abstract] The authors sought to increase knowledge about quantitative features of inhibitor reactions with alkyl and peroxide radicals, based on the example of the reaction of 4-methoxyphenol (MPh) toward the radicals  $R^{\cdot}$  and  $RO_2^{\cdot}$  of n-decane, which was studied by a chemiluminescent method. Concentrations of MPh were measured spectrophotometrically at 60° C. Results showed that consumption of MPh in reaction with  $R^{\cdot}$  was less than half as rapid as the rate of initiation and increased as  $[MPh]_0$  amounts were increased. With higher temperature the constants of MPh reaction converged, indicating the formation of a polar transitional state that explained the more rapid reactions with peroxide radicals compared to alkyl radicals. Even with similar reaction rate constants, the contribution of alkyl radicals was slight. Figures 3; references 13: 12 Russian, 1 Western.

[335-12131]

UDC [547.534.1+547.5.1]:542.943.542.978

INHIBITION OF HYDROCARBON OXIDATION WITH MIXTURES OF PHENOLS WITH EQUAL INHIBITING EFFECTIVENESS

Moscow NEFTEKHIMIYA in Russian Vol 22, No 4, Jul-Aug 82 pp 464-468

ARAKELYAN, E. A., AZATYAN, N. A., MESKINA, M. Ya. and MAYZUS, Z. K. (deceased), Institute of Chemical Physics, ArSSR Academy of Sciences; Institute of Chemical Physics, USSR Academy of Sciences

[Abstract] Synergism of inhibitors that react with peroxide  $RO_2^{\cdot}$  radicals has been established by detailed study. The present research established features of the inhibiting reaction of 4-methoxyphenol (MPh) and 2,4,6-trimethylphenol in oxidation of ethyl benzene and cumene. It was found that they had a very similar reaction speed constant. They were studied in both low-temperature initiating oxidation and in conditions of degenerative branched oxidation of the indicated hydrocarbons. While similar in effectiveness, the two phenols diverged in the inhibiting period when used separately, with MPh having a shorter period than mesitol. Maximum effectiveness had been found with a 1 : 1 ratio of the inhibitors (in an earlier study). The present study indicated need for greater quantities of mesitol. While at low temperatures the synergistic effect was confirmed, during high-temperature oxidation both synergism and antagonism were observed. Mathematical modeling showed that a combined reaction of the inhibitors and their participation in a chain growth were accompanied by the formation of a new inhibiting compound during the reaction. Figures 2; references 10: 9 Russian, 1 Western.

[335-12131]

UDC 547.841:542.943:542.978:541.128

## OXIDATION INHIBITORS OF RINGED AND LINEAR ACETALS

Moscow NEFTEKHIMIYA in Russian Vol 22, No 4, Jul-Aug 82 pp 474-476

KURAMSHIN, E. M., ZLOTSKIY, S. S., IMASHEV, U. B. and RAKHMANKULOV, D. L., Ufa Petroleum Institute

[Abstract] To reduce oxidation damage of acetals, the authors studied the mechanism of inhibited oxidation and sought to determine the most effective means of stabilizing acetals. The examples used were 4,4-dimethyl-1,3-dioxane, used in isoprene production, and 1,1-dibutoxyethane, a promising solvent for polymer and paint coatings. Manometer measurements of oxygen absorption were made at 60° C, with an initiator of azoisobutyronitrile. Test objects were phenol, alpha-naphthol, 2,-6-di-tert-butylphenol, 4-methyl-2,6-di-tert-butylphenol, bis-(pentylthio)acetal of 3,5-di-tert-butyl-4-oxybenzaldehyde, alpha-naphthylamine, and phenyl-alpha-naphthylamine. Results showed that phenols and aromatic amines form associates with acetals that markedly reduce their effectiveness as inhibitors. The most effective antioxidants were aromatic amines, since they exhibited less solvation effects than phenols. References 9: 8 Russian, 1 Western.  
[335-12131]

UDC 542.943:542.978

## SELECTIVE INHIBITING IN OXIDATION PROCESSES

Moscow NEFTEKHIMIYA in Russian Vol 22, No 4, Jul-Aug 82 pp 510-512

LADYGIN, B. Ya., TAVADYAN, L. A., BLYUMBERG, E. A. and EMANUEL', N. M., State Scientific Research Institute of the Nitrogen Industry and of Products of Organic Synthesis; Institute of Chemical Physics, USSR Academy of Sciences

[Abstract] In liquid-phase oxidation of hydrocarbons, selectivity, related to chain length, rate of disintegration of intermediate products, and mean hydrocarbon consumption, is made such harder to determine when several active centers lead to the formation of alternate paths and side products. The authors propose a principle for selective inhibiting of undesired directions of reaction by using stable nitroxyl radicals as additives. A condition that enables this possibility is the lack of inter-chain reactions. The disintegration of hydroperoxide that reduces selectivity includes monomolecular disintegration, disintegration of hydroperoxide associates, bimolecular disintegration involving solvents and molecular disintegration without formation of free radicals. In production of hydroperoxides where ecological and safety considerations come to the fore, the reaction is conducted with little air consumption, thus enhancing the role of R' radicals. The proposed method guides the direction of reaction by use of anthraquinone, which is regenerated from its adduct with alkyl radicals and which reacts with the involvement of molecular oxygen. Figures 2; references 5 Russian.  
[335-12131]

UDC 547.313:542.943.7

PRINCIPLES OF LIQUID PHASE OXIDATION OF OCTENE-1

Moscow NEFTEKHIMIYA in Russian Vol 22, No 4, Jul-Aug 82 pp 543-546

CHERNYAK, B. I., NIKIPANCHUK, M. V., KOZAK, S. I. and PYRIG, I. Yu., L'vov  
Polytechnical Institute

[Abstract] Olefin oxidation by molecular oxygen leads to numerous valuable products; various heterogenic catalysts promise to increase such production markedly. The most active such catalysts are  $Co_3O_4$  and  $Mn_2O_3$ , which the authors studied for consistency and chemical mechanism of formation, and the ratios of basic products of the title oxidation. These were identified to be hydroperoxide, alpha-oxide, enanthic and formic acids, amylyvinylketone, amylyvinylcarbonyl, enanthic aldehyde and  $CO_2$ . With the development of oxidation and accumulation of acids, the key feature was the decomposition of dioxethane with formation of enanthic aldehyde and formaldehyde, and epoxidation of octene-1 by peracyl radicals. Both catalysts changed the ratios of products formed, with  $Mn_2O_3$  leading to more production of hydroperoxide.

Figure 1; references 5 Russian.

[335-12131]

PHARMACOLOGY AND TOXICOLOGY

UDC 615.2/3:002.6]681.31

GOALS AND OBJECTIVES OF AUTOMATED PHARMACEUTICAL INFORMATION RETRIEVAL  
SYSTEM MEDICATIONS

Moscow FARMATSIYA in Russian Vol 31, No 4, Jul-Aug 82 (manuscript received  
17 Aug 81) pp 6-10

TENTSOVA, A. I., GERCHIKOV, L. N., SEMENOVA, T. D., KUMANINA, N. P.,  
MOSHKOVA, L. V. and SHASHKOVA, G. V., All-Union Scientific Research Institute  
for Pharmaceuticals, Moscow

[Abstract] To cope with the growing volume of information on pharmaceutical products and the need to service several interested ministries and specialized branches of the economy, the author's pharmaceutical institute has instituted a branch automated information retrieval system named "Medications." It aims at providing information to medical and pharmaceutical workers, dealing with changing specifications, improving specialized publications by providing up-to-date information, and offering a centralized data bank. Information provided will include nomenclature, indications and contraindications, possible side reactions and reactions with other medication, antidotes, etc., for both domestic and foreign preparations. Both patented and unpatented substances will be included, with Russian, Latin and international labelling. The data will be available to medical practitioners, pharmacists, research and government institutions. References 9 Russian.

[326-12131]

UDC 614.27+615.12]:002.6(47+57)

ALL-UNION CLASSIFIERS OF TECHNICAL AND ECONOMIC INFORMATION AND THEIR USE IN  
PHARMACY SYSTEM

Moscow FARMATSIYA in Russian Vol 31, No 4, Jul-Aug 82 (manuscript received  
22 Jul 81) pp 10-13

KOBZAR', L. V., YERMAKOVA, V. Ya. and ABDURAKHMANOVA, All-Union Scientific Research Institute for Pharmacy, All-Union Information Bureau of the USSR Health Ministry, Moscow

[Abstract] To promote better automation of medical supply and administration of the pharmacy system of the USSR, work is being done on standardizing and

centralizing information from various branches of the economy. Efforts are being directed at timely reporting of data, standardization of terminology on the basis of the title systems including interagency codes for the medical industry and health services, and other forms of computerized information retrieval. Various classification systems that have been used are being standardized and integrated into a single system, and measurements are also being standardized. Indexing will provide for location of previously labeled substances. The central agency for the system will be the All-Union Scientific Chemicopharmaceutical Institute imeni S. Ordzhonikidze. Industrial, agricultural and governmental agencies will be involved. References 5 Russian.  
[326-12131]

UDC 615.917:631.542.25:547.313.4]074:543.544

ISOLATING BUTYL CAPTAX IN FORENSIC CHEMICAL INVESTIGATION OF BIOLOGICAL MATERIAL

Moscow FARMATSIYA in Russian Vol 31, No 4, Jul-Aug 82 (manuscript received 20 May 81) pp 34-36

ASATOV, Z. I. and IKRAMOV, L. T., Tashkent Pharmaceutical Institute

[Abstract] To achieve the necessary isolation, the authors used thin layer chromatography to extract the title substance using various reagents. The most sensitive to butyl captax was bromphenol blue, which identified a 0.50 meg quantity of the preparation. Details of the more than 20 variants of solvent systems tested are summarized. Results showed that an 80.32% ethanol solution extracted the highest amount of butyl captax. The use of a 1 : 1 n-hexane-benzene system for extracting butyl captax from biological material, in this case the liver of a cadaver, was shown to be effective. Sodium nitroprusside and Dragendorf reagent were found to be the most sensitive and specific reagents. References 6 Russian.  
[326-12131]

POLYMERS AND POLYMERIZATION

THERMOSTABLE POLYMER DEVELOPED

Moscow SOTSIALISTICHESKAYA INDUSTRYIA in Russian 18 Sep 82 p 2

[Article: "Thermostable Polymer"; no author indicated]

[Text] TASS, Leningrad--The motor of a tractive electric locomotive can tolerate easily heat up to 300 degrees if the core of the machine is protected by "Rolivsan", a new thermostable polymer. It was synthesized by scientists at the High Molecular Compounds Institute of the USSR Academy of Sciences. After experimental testing, the original material was sent to an experimental factory in the Ukrainian city of Rubezhnoe, where mass production of new items is adjusted.

The polymer is resistant to the effects of corrosive fluids, has mechanical durability and is non-toxic. Many branches of industry are interested in the product. The range of its application is broad.

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CSO: 1841/14

## PROSPECTS FOR DEVELOPMENT OF POLYMER TECHNOLOGY

MOSCOW PERSPEKTIIVY RAZVITIYA TEKHOLOGII POLIMERNYKH MATERIALOV (NOVOYE V ZHIZNI, NAUKE, TEKHNIKE: SERIYA "KHIMIYA") in Russian No 8, Aug 82 (signed to press 5 Aug 82) pp 2-6, 62-64

[Annotation, table of contents, foreword and "Lecturer's Column" from book "Prospects for Development of Polymer Technology (Advances in Life, Science, Technology: Series 'Chemistry')", by Doctor of Technical Sciences Aleksandr Bernardovich Pakshver, RSFSR distinguished scientist and engineer, State Prize laureate; Candidate of Technical Sciences Yuriy Nikolayevich Neyyenkirkhen; and Doctor of Chemical Sciences Anatoliy Fedorovich Nikolayev, RSFSR distinguished scientist and engineer; compiled by Doctor of Chemical Sciences Valentin Yevgen'yevich Gul'; reviewed by Candidate of Technical Sciences Maks Isaakovich Rokhlin, Izdatel'stvo "Znaniye", 28,430 copies, 64 pages]

[Text] This booklet acquaints the lay reader interested in chemistry with the objectives and prospects for development of the science and production of highly promising materials of the 20th century--polymers.

This publication is intended for lecturers, propagandists, students of peoples universities and all interested in scientific-technical progress.

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#### Foreword

Swift development in practically all sectors of science and technology is typical of the 20th century. Progress in some of these sectors has been so phenomenal that it has significantly determined the course of civilization's development in our era. Among these sectors of science and technology is the science of the production of polymers and their processing into articles.

Polymers are chemical substances characterized by high molecular weight (on the order of tens of thousands, going as high as  $10^6$ ) and by macromolecules structured as chains. They include resins, plastics, fibers and elastomers (synthetic and natural rubbers).

Much attention is being devoted in our country to the production, processing and use of polymers in the national economy. The intensity with which these sections are developing increased significantly following the May (1958) CPSU Central Committee Plenum, which was devoted to development of chemical industry. Thus for example, in the period from 1966 to 1980 synthetic resin and plastic production increased by a factor of 4.5, while that of synthetic fibers and filaments increased by a factor of 7.3. The USSR has assumed first place in the world in relation to the volume of the major kinds of rubbers produced--polyisoprene and butadiene rubber.

Accelerated development of the technology of organic polymers is playing an important role in the creation of communism's material-technical base. In his welcoming address to participants of the International Symposium on Macromolecular Chemistry in 1978, L. I. Brezhnev emphasized that "the solution of the complex problems of creating highly productive production processes, making sensible use of minerals, protecting the environment and satisfying human needs more fully are associated with further development of polymer chemistry."\*

Our society's further technical progress would be unimaginable without development of the production of polymers and their extensive use. Polymers are boldly displacing traditional materials such as cast iron, steel and alloys, not as "substitutes" but as materials possessing a better complex of operational properties: strength per unit weight, corrosion resistance, ease of processing, low energy and material demand in their acquisition and processing, and a number of other advantages. Thus for example, much less energy is

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\* PRAVDA, 18 October 1978.

required to produce and process plastics than the same quantity of tin and aluminum. Energy outlays are commonly compared in relation to petroleum using the so-called petroleum equivalent (p.e.), the consumption of which for the processing of plastic is 3.4-5.3 times lower than for the processing of tin and sheet aluminum. It takes 230 tons p.e. to produce 1 million 1-liter bottles from glass, and only 97 tons p.e. to produce such bottles from polyvinyl chloride; it takes 700 tons p.e. to produce 1 million paper bags, and 470 tons p.e. to produce the same number of polyethylene bags. The social aspect of using polymers in the national economy is also acquiring important significance. Thus for example, for every ton of polymers he makes, every worker in chemical and petrochemical industry saves the labor of 3 to 4 workers in ferrous and nonferrous metallurgy and the labor of 3 persons in machine building.

An impressive amount of work was done in organic polymer production to protect the environment during the 10th Five-Year Plan: A number of gas scrubbing facilities were built and put into operation (for example at the Kiev "Khimvolokno" Production Association, at the Cherkassy Chemical Fiber Plant and elsewhere), a method of removing mercury from gaseous exhausts during vinyl chloride production was developed and introduced, and waste water treatment plants were built on a large scale.

Environmental protection measures are often based on the use of polymers. Thus for example, a method has been introduced for removing dust from gases based on the use of polypropylene filter material.

Spent polymers are being recycled more and more frequently, which is not only helping to protect the environment from pollution but also promoting a savings of raw materials and intermediate products as a result of their replacement by production wastes.

The 26th CPSU Congress developed a scientifically grounded program for raising the level of planning and improving the economic mechanism. This program, which was described in detail in the "Basic Directions of the USSR's Economic and Social Development in 1981-1985 and in the Period to 1990," includes a section dealing with chemical and petrochemical industry. This action requires that we increase production of synthetic resins and plastics to 6-6.25 million tons and of chemical fibers and filaments to 1.6 million tons by 1985; we must increase production of synthetic rubbers substituting for natural rubbers, and raise tire life; we must expand tire production for high-capacity dump trucks and scrapers, and low pressure tires for agricultural machinery and motor vehicles; we must develop production of high quality polymers with prescribed technical characteristics, to include reinforced and filled plastics, as well as plastic tubing.

Specific-purpose integrated programs are an inherent part of the state plans for economic and social development in the 11th Five-Year Plan. A number of specific-purpose integrated programs are devoted to development of the science and production of polymers. One example we can cite is the specific-purpose integrated program for chemicalization of the national economy. Another is the integrated program for creation and introduction of new

plastics and articles made from them into highly productive automatic processes, and creation and introduction of equipment for the production and processing of plastics.

By completing the tasks posed to the producers of organic polymers in the 11th Five-Year Plan, we will be able to more effectively solve the problems associated with progress in industry, agriculture and other sectors of the national economy, and of raising the people's standard of living.

The first chapter, which is devoted to the problems associated with production of fiber-forming polymers and with their processing into fibers and fabrics, was written by Professor Aleksandr Bernardovich Pakshver, one of the prominent specialists in this area.

The second chapter discusses similar problems in the production of natural and synthetic rubbers. It was written by Yuriy Nikolyevich Neyyenkirkhen, who participated for many years in the development of Soviet rubber industry.

The third chapter examines the synthesis and processing of plastics and synthetic resins. The chapter was written by Professor Anatoliy Fedorovich Nikolayev, well known to a wide circle of chemists for his monographs and publications devoted to these questions.

I believe that owing to its format and the qualities of the selected authors, the booklet will competently illuminate all aspects of new directions in the production, processing and use of the principal types of polymers.

#### Lecturer's Column

About two-thirds of the world's total plastic production is represented by high-demand products: polyethylene, polyvinyl chloride and polystyrene. The main areas of their use are construction, packaging, machine building, electronics and transportation. So-called special plastics, for example polyformaldehyde, polycarbonates, fluoropolymers, silicones, polyamides and epoxy resins, make up a total of 2 percent.

By introducing special monomers, we get polymers that may be used at temperatures of 200-400 °C (formerly this was an area of application limited to inorganic substances). But this limit, which has been achieved today for some polyimides and polysulfones, will probably not be surpassed in the near future. In the most favorable cases a temperature of 540 °C can be attained. Polyimide plastics developed especially for supersonic flight can withstand a temperature of up to 465 °C for 30 minutes. Thus in the next 10 years there is a fully realistic possibility for creating plastics exhibiting the thermal stability of aluminum, but we will hardly be able to attain the heat resistance of steel. The main consumer of heat resistant plastics remains aviation and rocket technology, but they are penetrating more and more broadly into motor vehicle and machine tool building, and into electrical engineering (they are used as insulation on conductors in modern electric motors).

The proportion of synthetics used today in footwear industry varies within 30-50 percent, while in boot manufacture it reaches as much as 70 percent. This of course also includes soles, primarily polyurethane soles which are easily manufactured by a simple foaming process. Polymenthol is used for these purposes in the USSR. It is unique in that it binds molecules of oxygen and CO<sub>2</sub> from air, owing to which materials acquire the remarkable quality of being able to increase their volume. The soles of shoes worn by a runner become thicker, and not thinner as he runs!

Chemical fibers are now being produced by almost a third of all of the earth's countries, and for the most part they are consumed in the same places. Forty percent of the world's total fiber production is consumed by 15 percent of the planet's population residing in capitalist industrial countries. Of this amount, 60 percent are synthetic fibers. Meanwhile, most of the planet's population (about three-fourths), especially that residing in weakly developed regions, has less than a third of the total textile materials available to it.

In 1970 each person on earth consumed an average of 7 kg of all kinds of fibers. It is suggested that in the year 2000, there will be 9-12 kg of fiber for every person, with the maximum proportion of synthetics being 70 percent.

To seal small expansion gaps arising between concrete structures when a building is assembled, we need substances that can withstand large temperature fluctuations and sizable mechanical loads. Polyurethanes, silicones, acrylates and combinations of epoxy resins are among suitable seam fillers. They can be used not only to fill seams in the facades of steel and light metal buildings, but they can also "glue" bridges and taxiways at airports, and secure together parts of structures that are completely under water (in swimming pools for example).

So-called carpet wallpaper has been developed in the GDR. Its thickness is 5 mm. It consists of millions of synthetic fibers penetrating into a fabric backing. Such wallpaper has excellent soundproofing properties.

About 50 percent of all foam plastics are manufactured today from polyurethane. Using basically the same kinds of chemical reactions, in which a component containing a hydroxyl group is processed with diisocyanate, we can obtain both thermoplastics and thermosetting plastics. In all cases polyurethanes are the reaction products, but their properties depend on the choice of the initial component. Depending on what monohydric alcohols and additional components are used in the transformation, we can obtain, for example, foam plastic so soft that it can be used in pillows and as a lining for winter clothing, or so hard that it can be used to make packaging or high quality insulation for refrigerators. Between these two extremes there are semi-rigid materials, the spectrum of application of which extends from the manufacture of motor vehicle bodies to footwear production. Large parts with massive outer zones--motor vehicle and furniture parts--can be molded out of ultrahard "cross-linked" foams. These and other polyurethane articles can be made directly from the substance obtained as a result of the initial reaction; moreover the finished products satisfy the requirements imposed on the quality of the material and its specifications.

In February 1980 a report appeared in NEWSWEEK that the American Polymotor Research Corporation (New Jersey) has manufactured a motor vehicle engine from heat resistant plastic reinforced with glass and carbon fibers. Only the crankshaft and piston rings are still metal. The engine weighs twice less than a metal engine and, moreover, it consumes 15 percent less fuel. The corporation declared that this work is continuing, and that all-plastic engines will soon be produced.

Fiber glass is an interesting material for motor vehicle bodies. Its hardness is almost equal to that of steel. Just the fact that this material is used to make bullet-proof vests speaks for itself. Moreover fiber glass is simultaneously light, about a fourth as light as steel. A motor vehicle made from it or a similar material (for example glass fiber-reinforced thermoplastics, of which polyamide is the most promising) will weigh about one-sixth less than a metal motor vehicle of the same size, and it will have better operating qualities. Moreover it can be molded to whatever form desired by the designer, and dyed any color. Today of course, the use of such bodies is limited--only to some experimental and sports models.

This section was prepared from materials contained in the book "Khimiya na puti v tret'ye tysyacheletiye" [Chemistry on the Road to the Third Millennium] by Z. Poller (Moscow, Mir, 1982).

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11004

CSO: 1841/2

RUBBER AND ELASTOMERS

UDC 678.763.2:678.0

TECHNOLOGICAL CHARACTERISTICS OF BEHAVIOR OF MIXTURES CONTAINING CHLORINATED BUTYL RUBBER

Moscow KAUCHUK I REZINA in Russian No 8, Aug 82 (manuscript received 19 Mar 81) pp 11-13

LEVIT, Ye. Z., OGNEVSKAYA, T. Ye. and DEDUSENKO, V. N., Scientific Research Institute KGSh [not further identified]

[Abstract] The behavior of chlorinated butyl rubber (CBR) and *cis*-isoprene (CI) mixtures was studied with selective vulcanization of one of the phases, using the ability of CBR to cross-link with zinc oxide in the absence of sulfur or accelerators, or in thermovulcanization. Addition of CBR to CI, both with and without zinc oxide, resulted in lower plasticity and higher viscosity, differing from the sum of component properties. Mixtures containing CBR were more affected by heating, due to cross-linking. Selectively vulcanized mixtures did not lose plastic deformation and flow properties, or shape maintainance, on mechanical treatment, while increasing plasticity and decreasing viscosity more than CI alone. Selectivity vulcanized samples behaved differently from mixtures of CI with the dust from CBR-containing samples. In the transitional layer between the two phases covulcanization and bond formation can occur via free radical polymerization and polyisoprene chlorination. The network formed limits plastic deformation but does not increase tensile strength. This network is disturbed by heat or roller treatment, so that the treatment temperatures of such samples must be strictly limited. Figures 3; references 5 Russian.

[331-12126]

EFFECTS OF VARIOUS TYPES OF PLASTICIZERS ON PROPERTIES OF RUBBERS BASED ON SKI-3, SKD AND THEIR COMBINATIONS

Moscow KAUCHUK I REZINA in Russian No 8, Aug 82 (manuscript received 10 Sep 80) pp 14-16

VASIL'YEVYKH, N. Ya., PRUZHANSKAYA, N. A. and SHVARTS, A. G., Scientific Research Institute of the Tire Industry

[Abstract] A study was conducted of the effect of several plasticizers, including ten paraffin-naphthenic, naphthene-aromatic and aromatic petroleum fractions, as well as trimethyltriethanolamine and silicone oil ETS-40, on the properties of mixtures and vulcanizates based on SKI-3, SKD and their 1:1 mixture. Swelling in *m*-xylene was used to determine solubility, compatibility and intermolecular intercation. Trimethyltriethanolamine and silicone oil were incompatible with the rubber samples, while the naphthene-aromatic, paraffin-naphthenic, vaseline and one of the aromatic petroleum plasticizers had the best compatibility. This observation is connected with the small molecular mass of these oils. For the rubbers combining SKI-3 and SKD, differences between moderately compatible plasticizers were less pronounced. Less compatible plasticizers gave a greater hysteresis loss in coated vulcanates, compared to the more compatible additives. An upper limit was observed for the effect of compatible plasticizers on elastomer properties. The data indicate that hysteresis loss depends on the degree of compatibility of the plasticizer and the rubber, which is determined by thermodynamic affinity and molecular mass. Figures 3; references 5 Russian.

[331-12126]

FACTORS AFFECTING CONDITIONS OF DEFECT-FREE STORAGE OF ROLLED CALENDERIZED RUBBER

Moscow KAUCHUK I REZINA in Russian No 8, Aug 82 (manuscript received 10 Mar 81) pp 31-33

NEMYTKOV, V. A., MODNOV, S. I., KUZNETSOV, A. D. and GONCHAROV, G. M., YAPT [not further identified--a tire institute? industrial institute?]

[Abstract] A mathematical treatment of the influence of internal stress on surface quality in rolled calenderized rubber is presented. The effect of this stress on defect development was studied in rolls of mixed NK and SKB rubber, using a tensometric bobbin. Maximal radial pressure depended on the number of layers, rubber sheet caliber, pressure and thickness of interlayers, bobbin dimensions and rate of calenderizing. Doubling of rubber and fabric samples under constant pressure was used to study adhesion processes resulting from radial pressure and leading to deformation and defect development. Force

required for separation increased sigmoidally with doubling pressure and exponentially with holding time. Defining exposure as the product of pressure and time, a critical exposure is observed at which a sharp rise in separating force begins. In the samples used in this study this critical exposure was 0.96 megapoise hour. While the nature of the interlayering material had less effect than the factors discussed above, cambric gave maximal adhesion and chefer minimal. The results obtained may be used in determining the degree of lowering of residual stress needed in preparing calenderized rubber and in calculating the probability of defect development. Figures 4; references 10 Russian.

[331-12126]

UDC 678.074:621.318.1:538

#### ISOTROPIC ELASTOMERIC MAGNETIC ARTICLES

Moscow KAUCHUK I REZINA in Russian No 8, Aug 82 (manuscript received 10 Sep 81) pp 33-35

ALEKSEYEV, A. G., AYZIKOVICH, B. V., KLIODT, M. F. and KIYUTS, N. F., Leningrad Branch, Scientific Research Institute of the Rubber Industry

[Abstract] In contrast to elastic magnetic circuit components, standards of magnetic susceptibility used for instrument calibration require uniform, isotropic magnetic properties in all directions. The possibility of fabricating such isotropic articles from magnetically soft rubber was investigated. Nickel-zinc ferrite 600 NN powder with nearly spherical particles served as the magnetic filler. Cubes were formed with SKI-3, SKN-18M, SKN-40M, NK and chloroprene PNK rubbers and evaluated with a nonstatic magnetometer. The method of preparing the samples was found to significantly determine the degree of anisotropy, with the calenderizing effect being more important than temperature of vulcanization. Fine rubber flakes gave the best results. The viscoelastic properties of the rubber and pressure during vulcanization also affected anisotropy, but to a lesser degree. Use of NK or SKI-3 vulcanized at 3.0-4.5 megapoise gave significant reduction in anisotropy. References 6 Russian.

[331-12126]

UDC 678.4.01:536.485

RUBBER COLD RESISTANCE IN EXTERIOR LAYER OF HYDRAULIC BRAKE HOSE

Moscow KAUCHUK I REZINA in Russian No 8, Aug 82 (manuscript received 25 Jun 81) pp 45-46

RAZZHICAYEVA, K. Z., SOLODENKO, V. D. and MURAVKINA, R. F., Planning Department, Balakovorezinotekhnika, Volzhsk Automobile Factory

[Abstract] Since front brake hose cracking is most frequent in Siberia and the Far East, rubber cold resistance appears to be involved. The effect of SKD-P rubber content, reported to increase cold resistance, on fatigue resistance was studied under angular rotation conditions. Increasing SKD-P content was found to lower temperature friability, but also stability characteristics, so that fatigue resistance was decreased. Figures 1; references 1 Russian.

[331-12126]

UDC 541.64.678.743.2.048.66.092

STUDY OF KINETICS OF SKF-32 RUBBER DESTRUCTION AND ANALYSIS OF VOLATILE PRODUCTS BY MASS SPECTROMETRY

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 266, No 1, Sep 82 (manuscript received 22 Jan 82) pp 177-179

KHAKIMOVA, R., USMANOV, Kh. U., academician, UzSSR Academy of Sciences and ESHBAYEV, F., Tashkent State University imeni V. I. Lenin

[Abstract] The desirable properties of SKF-32 and SKF-26 rubbers, such as high heat durability, chemical stability and resistance to corrosion have brought wide use. These rubbers, however, also have the drawback that when in contact with metals, they cause corrosion. To control that shortcoming, the authors studied the title kinetics when the stabilizer 2,4-dichlorophenoxyethylbenzofuran was added to SKF-32. Thermodynamic and thermooxidational destruction was measured at 603-623 K, and argon and mercury peaks were compared for standardizing mass-spectrometry. At all temperatures, reduced volatility was observed with the additive. Mass loss and mass spectra suggest the probable mechanism of the stabilizer to result from its contributing a relatively inactive radical to the compound. The results suggest further testing of benzofuran derivatives as thermal stabilizers for fluororubbers. Figure 1; references 9: 8 Russian, 1 Western (US patent) [1-12131]

## WOOD CHEMISTRY

### NEW METHOD FOR PRODUCTION OF FODDER ADDITIVES

MOSCOW SOTSIALISTICHESKAYA INDUSTRYIA 1 Oct 82 p 2

[Article by N. Nadezhina: "Protein Seasoning"]

[Text] Minsk--The introduction of new technology for processing plant raw materials suggested by scientists from the Belorussian Technological Institute imeni S. M. Kirov carries the same significance as construction of a new specialized factory.

In the Affiliate Scientific Research Laboratory of Chemical Wood Technology a process has been developed for obtaining valuable fodder additives--furfural and yeast. There is a new high-efficiency catalyst that replaces sulfuric acid, which previously was used for this purpose, and a two-zone processing of the raw material by opposing flows of steam; these features allow a 25-30 percent increase in the output of furfural and sugars from the raw material. The technological process is protected by patents No 573482 and No 721435.

After completion of industrial testing the technology will be implemented at the Kropotkin and Shumerlinskiy chemical factories and the Andizhan hydrolysis factory.

The cost of production will decline on the average by 25 percent by saving on raw material resources that are in short supply, reducing the energy costs, and increasing equipment productivity.

Introduction of the new technology only at hydrolysis industrial enterprises already in operation will provide an additional 6,000-8,000 tons of furfural and an additional 15,000-20,000 tons of yeast per year. It could also have a significant effect when used at new furfural-yeast factories equipped with high unit-capacity hydrolysis machinery.

9967

CSO: 1841/14

UDC 630\*863.002:631

MICROBIOLOGICAL PRODUCTION FOR AGRICULTURE

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian No 6,  
1982 pp 1-2

[Abstract] This report on an expanded session of the Main Administration of Microbiological Production of the USSR Council of Ministers and the Presidium of the Central Committee of Trade Union for Chemical and Petrochemical Workers outlines past accomplishments and plan targets for the 11th Five-Year Plan. The Ministry of Forest Products, Cellulose-Paper and Wood Processing Industry, the above ministry has established tasks for increasing production of fodder yeasts and lysine. Expansion of this production began in 1965, when the technical and material base for such production was programmed and personnel were trained to fill this need. Production of these materials is to be increased by 2.3 fold and major advances are to be made in other food additives, plant protection substances, bacterial fertilizers and other agricultural products. In the first 6 months of 1982, plan fulfillment in the above products lagged by, for example, 40,000 tons of food protetin, 165 tons of lysine and 870 tons of xylite. Capital investments are not being used efficiently, reserve production is not being distributed and operational shortcomings are frequently observed. Along with general improvements in effectiveness, new waste-free technology for producing protein, amino acids, vitamins and other active substances for food are being sought. Another area where improvements are anticipated is in training personnel for modern production operations.

[345-12131]

PRODUCTION AND USE OF OXIDIZED THALLO OIL FROM LEAFY TREES

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, 1982  
pp 6-8

TEREGERYA, V. V., TEREGERYA, N. V., VESHCHUKOV, G. F., ZOLOTOV, V. I.,  
Vladimir Polytechnical Institute, KUBETSKIY, G. M. and BALAKSHIN, P. N.,  
Kotlass Cellulose Paper Combine

[Abstract] Among numerous ways of obtaining oil substitutes from cheap raw materials, separation of thallo from leafy trees into fatty and resinous acids shows considerable promise. The authors studied prospects for producing secondary products by oxidizing thallo oils with atmospheric oxygen, using a production line with 1000 ton annual capacity. The installation, which is diagrammed and described, uses a periodic oxidation procedure, whose duration depends on the iodine number and the dynamic viscosity of the initial raw material, increasing with higher iodine numbers and lower viscosity. Rapid cooling prevents excessive oxidation levels. Optimum parameters for 1 ton of oxidized thallo oil are 50-60 cubic meters of air, 1.22 Kcal of heat energy and 94 kwh electricity. The final product, which meets requirements for stability, quantity of oxidized products and moisture content, has been used as an emulsifier, lubricant for non-ferrous metals and a heat stabilizer in polymers. Figure 1; references 4 Russian.

[345-12131]

680\*863.547.724.2

HYDROGENATION OF FURFUROL INTO FURFURYL ALCOHOL USING VARIOUS HETEROGENEOUS CATALYSTS BASED ON CUPRIC OXIDE

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, 1982 pp 12-13

BEKBULATOV, I. A., chief of section, MATYAKUBOV, R., senior scientific collaborator, ABDUGANIYEV, Ye. G., chief of laboratory and KOZHEVNIKOV, V. S., chief of the "Plastics" Scientific Production Association, Fergana

[Abstract] Furane compounds made from cotton, sunflower and rice waste products form the basis for numerous useful products. The authors studied the title hydrogenation, which has been known since 1906, in order to control contact load and heat generated during the reaction and thus avoid overheating and destruction of the catalysts. While currently used copper-chrome catalysts are selective, they have too low contact loading, lack of effective regeneration methods, and other complexities, as well as being in short domestic supply. The authors substituted a copper-silicon catalyst and increased selectivity from 92-96% to 99.4%, reduced pressure from 6.0 to 3.0-5.0 MPa, and reduced costs while improving health safety on the job. Thus use of sodium silicate instead of chromic oxide as a catalyst is recommended. References 3 Russian.

[345-12131]

STUDY OF BIOSTABILITY OF LIGNOPLASTICS

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, 1982  
pp 13-14

ARBUZOV, V. V. and FEDOSEYEV, V. F., candidates of technical sciences, and  
OVCHINNIKOV, A. I., engineer, research department, "Rosstroymaterialy"  
Project Technology Production Association, Saratov

[Abstract] Lignoplastics from hydrolyzed lignin are widely used for construction materials in the Urals, Volgograd Oblast and the Kalmyk ASSR. The authors studied their resistance to microorganisms using cultures "tagged" with radioactive  $^{32}\text{P}$  and compared durability to that of wood-fiber and lumber building materials. The effect of chemical composition on biostability of lignoplastics was also measured. Results indicated that the content of reducing substance and acid in the hydrolyzed lignin significantly affected biostability of the test blocks. With increased amounts of reducing substances in the pressed lignin, biostability went down, while increasing the acid levels brought increased durability. Reducing the moisture content also enhanced resistance to the tested *Coniofora cerebella* fungi. Figures 5; references 2 Russian.

[345-12131]

PRODUCTION OF MEDICINAL LIGNIN

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian No 6,  
1982 pp 21-22

LEVANOVA, V. P., candidate of technical sciences, GVOZDEVA, E. N., candidate of chemical sciences, ARTEM'YEVA, I. S. and BOYKO, T. A., senior scientific collaborators, SARAF, V. L., chief of section, All-Union Scientific Research Institute for Hydrolysis, SHIRYAYEV, A. M., director and ISAYEVA, L. V., engineer, Leningrad Hydrolysis Plant, "Gidrolizprom" Scientific Production Association

[Abstract] The medical preparation polyfepan (made from hydrolysed lignin) has passed state testing and been approved by the USSR Ministry of Health for use as a bacterial adsorption agent in the gastrointestinal tract of human. The authors sought to extend its use to animals by their study in collaboration with specialists of the Leningrad Veterinary Institute. Specifically, polyfepan was tested for prophylactic use and treatment of newborn calves. The lignin for the preparation came from conifer wood which had been hydrolysed by a yeast softening procedure. Since high polysaccharide content obviates use of the polyfepan label, the veterinary preparations was

called medicinal lignin. The equipment for producing this medication is diagrammed and described. A concentrate was developed for shipping purposes. Shortcomings of the production equipment have been identified and are being corrected so that full production can be entered. Figure 1; references 2 Russian.

[345-12131]

UDC 630\*863.002.5:663.14.033.2

TESTING AND USE OF YEAST GROWING APPARATUS WITH EIGHT CIRCULATING DIFFUSERS

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, 1982 pp 23-24

TUCHIN, V. I. and KAZAKEVICH, O. V., Lesozavodskiy Biochemical Plant

[Abstract] Reconstruction and modernization of a 1300 cubic meter yeast growing system in the authors' plant is described. Details of air distribution through 350 mm tubes and placement of cuvettes within the apparatus are summarized. Comparisons with other systems for this purpose and the micro-flora population in the 8-diffuser apparatus with the former "spider" air distribution showed that the quantity of raw protein produced in the new system was 2% higher than in the old system. Overall productivity was doubled, and along with quality advantages, it supported the conclusion that the innovative system should be adopted wherever similar operations were conducted. Figure 1.

[345-12131]

## MISCELLANEOUS

### POLYMER SIEVE

Riga SOVETSKAYA LATVIYA in Russian 14 Jul 82 p 2

[Article: "Sieve for Bacteria"]

[Text] To scoop up water with a sieve is not such an aimless pursuit. Belorussian scientists, in developing a very small polymeric "sieve" make water sterile in precisely this way. The microfilter freely passes molecules of the water, while retaining "massive" bacteria. Hereby, disinfection of fluids is simplified to the maximum: it is neither necessary to boil them, nor treat them with radioactive isotopes.

In order to prepare a trap for the bacteria, scientists of the Institute of Physical Organic Chemistry of the BSSR Academy of Sciences selected chemical compounds which force the molecules, for example, of capron, to form an unusual reticular structure with pairs of strictly defined size. As a result, a thin, elastic and very strong film, which in appearance reminds one of paper, is produced.

This development of the scientists has found use in microelectronics plants, where in only one year savings of about a million rubles have been realized.

Microfilters from polymer materials are irreplaceable in the microbiological industry and in preparing medicines; they can be used to preserve juices, completely retaining the vitamins. It is easy to put such a film in the back pack of a geologist, who, in traveling far from human habitation, can filter drinking water from any reservoir.

9978  
CSO: 1841/239

UDC 541.60+547.1+681.142.2

PROBLEMS OF MOLECULAR DESIGN AND COMPUTERS. PART 7. FORMAL LOGIC APPROACH  
TO ORGANIC REACTIONS. BASIC ASSUMPTIONS AND TERMINOLOGY

Leningrad ZHURNAL ORGANICHESKOY KHIMII in Russian Vol 18, No 8, Aug 82  
(manuscript received 21 Jul 81) pp 1561-1583

TRACH, S. S. and ZEFIROV, N. S., Moscow State University imeni M. V. Lomonosov

[Abstract] Continuing their treatment in previous articles (this journal, Vols 11, 12 and 17, *Chemica Scripta* Vol 15 No 4, 1980), the authors present terminology for symbolic equations to represent molecular design for disproportionization of bonds in chemical systems and reaction centers, the central topics of this article. Considered here are organic reactions as disproportionization of bonds in chemical systems, where terms such as canonical and non-canonical, basic and non-basic, initial and final are defined for the purposes of their computer design; disproportionization of bonds in corrected chemical, reactive and corrective reactive systems, where reactive centers and substituents are discussed, as well as the rationale for their topology; local features of bond disproportionization, including a brief and simple methodology for finding all possible means of changing bond distribution in isolated reactive centers; and, finally, symbolic equations as the basic features of structural changes during organic reactions, which are to reflect all basic information about possible structural changes and thus are the central assumptions of the approach. A hierarchical classification system and comparative indicators to label organic processes will be offered in later articles. References 22: 13 Russian, 9 Western.

[341-12131]

CSO: 1841

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